ASSESSING THE ROLE OF THIRD-PARTY AUDITS IN ENSURING PRODUCER COMPLIANCE WITH THE ROUNDTABLE ON SUSTAINABLE PALM OIL (RSPO) CERTIFICATION SYSTEM

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Abstract

To address the social and environmental concerns around oil palm expansion within tropical forested regions, several voluntary corporate sustainability policies have emerged. The Roundtable on Sustainable Palm Oil (RSPO), the leading certification system for palm oil, is used to fulfill many of these pledges. The RSPO relies on auditors to ensure that palm oil producers comply with specific environmental, social, and legal principles and criteria (P&C). Yet, few if any studies have investigated changes made by oil palm growers to gain and maintain certification, or evaluated factors that may affect the likelihood of non-compliance, when a producer fails to conform with an RSPO criterion. The objective of this research was to investigate the RSPO third-party audit system's role in altering practices and conditions of certified plantations. Specifically, the research addressed the following three questions: 1) To gain and maintain certification, how many and what kind of changes must oil palm producers make? 2) How do issues perceived by the public as problematic in the oil palm industry compare to on-the-ground problems verified by auditors? 3) Which factors, including actors involved in audits, influence any audit-induced changes? To answer these questions, we compiled and analyzed data from timeseries of annual audit reports for 72% of all certified oil palm plantations in Indonesia as of December 2015 (n = 116 plantations and 253 reports). We re-categorized non-compliances into four categories (social, environmental, legal, managerial) and 36 thematic areas. We then quantified the number internet query results for each thematic area. With linear mixed models, we identified factors associated with non-compliance frequency and severity. We found that certified mills were required to address 3.3 ± 4.3 non-compliances per audit, with the most non-compliances detected at initial certification. The average time to close a major non-compliance was 63 ± 80 days, while minor non-compliances required 191 ± 206 days to resolution. While environmental issues were most frequently returned by our internet search, RSPO certification demanded the most changes in the social category (39%), followed by plantation management (28%), environmental practices (20%), and legality (13%). RSPO member was significantly correlated with the total number of non-compliances, suggesting that each member has a different "cost of compliance." Results indicate that RSPO certified plantations must make real changes to achieve certification, suggesting that certification is not simply "greenwashing." To improve transparency, and support auditors and growers in tracking and resolving non-compliances, we recommend that the RSPO adopt a uniform audit report document and record non-compliances within a central database.

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Introduction

Global demand for agricultural commodities increased rapidly over the past several decades. Growing global population and wealth are driving changes in dietary patterns, food consumption, and therefore food production, with an increasing proportion of agricultural production destined for export (MacDonald et al., 2015). Agricultural production has expanded particularly rapidly in the tropics (Foley et al. 2011). Export-oriented tropical commodities including coffee, cocoa, rice, palm oil, rubber, and soybean account for most crop expansion (Donald, 2004; Phalan et al., 2013). From 1970-2010, the area devoted to production of these crops nearly doubled, from approximately 180 million hectares to 310 million hectares (FAO Database, 2014). This tropical agricultural expansion has been a driving economic force for developing countries as they rely on agriculture to support Gross Domestic Profit growth.

Agricultural expansion is, however, criticized as a dominant cause of tropical deforestation (Angelsen, 2010; Carlson et al., 2012; Gibbs et al., 2008; Laurance et al., 2010; Newton and Wollenberg, 2013; Rudel et al., 2009). Land cover change in the tropics is tightly linked to four major commodities: beef, soybeans, palm oil, and wood products. From 2000 to 2011, these four commodities were responsible for approximately 40% of total deforestation in a case study of seven tropical countries (Henders et al., 2015). Palm oil is the highest volume traded vegetable oil commodity worldwide and represents approximately 27% of the world oil crop market (FAO, 2014). The crop is primarily used as a refined oil for a variety of products including edible fats, soaps, and biofuels. Palm oil is the cheapest globally available edible oil, and a primary cooking oil in countries including India, China, Indonesia, and parts of Africa (USDA FAS, 2010). In 2014, Indonesia was the largest palm oil producer and exporter, accounting for more than half of total global production of palm oil (Indonesia Investments, 2016). In 2014, Indonesia and Malaysia contained 65% of global oil palm harvested area (FAO, 2014). Around 10% of Indonesian export revenues are generated by the palm oil industry, which produced approximately 33 million tons of palm oil in 2014 (Brandi et al., 2015).

Commodity-driven deforestation has diverse environmental impacts, including carbon emissions, biodiversity loss, changes in the hydrological cycle, and soil degradation (Lenzen et al., 2012). For example, forest conversion to oil palm plantations in Southeast Asia resulted in a loss of approximately 75% of forest-dwelling bird species, 80% of forest-dwelling butterflies, and a shift in the composition of bee populations (Wilcove et al., 2013). Commodity expansion into and conversion of tropical forests generates substantial carbon emissions to the atmosphere (Carlson et al., 2012). Oil palm expansion in Southeast Asia has led to drainage of extensive carbon-rich peatlands, which leads to large fluxes of carbon to the atmosphere and makes these soils highly susceptible to fire (Couwenberg et al., 2010; Koh et al., 2011; Marlier et al., 2015). Deforestation also affects hydrological and nutrient cycles. Forest conversion to agriculture changes the flux of nutrients into water bodies, which can affect water quality and stream ecosystem function, and can also alter stream hydrological regimes including the amount and timing of stream flows. Carlson et al. (2014) found that compared to an intact forest watershed stream, streams draining oil palm plantations experienced higher concentration and yield of sediments, warmer temperatures, and reduced oxygen saturation.

In addition to impacts on ecosystems, commodity-driven deforestation affects local communities and people. Key social issues associated with tropical commodity agriculture include land right conflicts, abuse of labor laws, gender inequality, and poverty (Milder et al., 2015). In Southeast Asia, local communities and palm oil companies frequently experience conflict over land tenure. In Indonesia, while the Basic Agrarian Law recognizes customary land rights, the Forestry Law of 1999 considers customary forests as a subset of the larger state forest (Indrarto et al., 2012). Case studies in Indonesia, Malaysia, and Cambodia have described human rights abuses in the palm oil sector, where migrant workers may be offered jobs under false pretenses, and are often overworked and underpaid (Colchester et al., 2011). Another major concern in the palm oil industry is the rights of female workers. Women who are able to find work on a plantation are subjected to hazardous jobs, such as spraying pesticides and fertilizers (Colchester et al., 2011). Finally, the oil palm industry does not benefit all actors equally. McCarthy (2010) found that individuals in the oil palm sector in Indonesia do not always receive economic benefits from this perceived prosperous commodity crop, especially in rural areas where local communities struggle to compete with agribusiness.

Voluntary Sustainability Governance

In efforts to confront the apparent "global crisis" in deforestation during the 1980s and 1990s (Doh & Teegen, 2003), non-governmental organizations (NGOs) pressured key actors, including industrialized national governments, private industry, and development banks, to address tropical forest loss. Initially, NGO campaigns intended to raise awareness among consumers and promote product boycotts (Doh & Teegen, 2003). Voluntary sustainability efforts to promote sustainable production and business practices arose in response to these campaigns and to increasing awareness regarding the global scale of forest loss (Komives & Jackson, 2014). These initiatives include zero-deforestation agreements, moratoria, and sustainability certification, and have sometimes been termed "non-state market driven" governance (Bernstein and Cashore, 2007) because they are undertaken by corporations instead of governments. To support these commitments, in the 1990s several organizations setting standards for sustainable practices emerged. These included the Forest Stewardship Council (FSC), the Rainforest Alliance's Sustainable Agriculture Network (RA-SAN), and Social Accountability International (SAI) (Komives & Jackson, 2014). Since the 2000s, the number of voluntary standards has increased steadily, with approximately 465 standards by 2017 (Ecolabel Index, 2017).

Eco-Certification Systems

Companies who have made such voluntary commitments often use certification systems to ensure that their practices meet certain social and environmental sustainability standards. These systems are usually composed of a written "standard", which is a set of requirements to be followed by program participants (Potts et al., 2014). In addition, certification systems include monitoring and verification mechanisms to ensure conformance to the standard. The number of voluntary standards dedicated to environmental and social sustainability grew rapidly in the past decade, increasing by 540% from 2006 to 2016 (Bartels et al., 2016). By 2014, about 400 standards for agricultural and forestry commodities covered industries ranging from aquaculture to non-GMO soy (Potts et al., 2014).

In the oil palm sector, the WWF arranged gatherings of palm oil stakeholders to participate in a meeting that lead to the creation of the Roundtable on Sustainable Palm Oil (RSPO) in 2004 (Schouten & Glasbergen, 2012). A multi-stakeholder organization, the RSPO is comprised of palm oil producers, processors, consumer goods manufacturers, retailers, banks/investors, environmental NGOs, and social NGOs, but excludes governments (Figure 1). Members share a common interest in tackling problems in the palm oil industry. However, each actor has a different motive for participating in the RSPO. For instance, WWF claims its participation in the RSPO is to help protect the environment, whereas Unilever's participation is based on a business perspective interested in long-term viability (Schouten and Glasbergen, 2011). The organization defines social, environmental, and economic sustainability guidelines through voting and negotiations by members (Garrett et al., 2016). The RSPO also offers certification that requires that producers conform to a comprehensive set of principles and criteria (P&C) encompassing social and environmental conditions. The RSPO follows a checklist governance type of auditing and is meant to allow all who wish to become certified to become certified (Schulze et al., 2006). In 2014, total global oil palm harvested area was 18.7 million hectares, whereas RSPO certified area totaled 2.6 million hectares; by 2017, 21% of the global palm oil supply was produced under the RSPO standard (FAO, 2014; RSPO- Impacts, 2017).

Impacts of Certification Systems

Several studies have examined how certification systems have approached environmental and social concerns, and whether these systems have been successful at generating improvements in these areas (Bacon, 2005; Becchetti & Cosntantino, 2008; Blackman & Naranjo, 2010; Giovannucci & Ponte, 2005; Rueda & Lambin, 2013). In many cases, research has found that certification alters environmental outcomes. Rueda & Lambin (2013) used a case study approach in Colombia to analyze the implementation of the Rainforest Alliance (RAN) coffee certification program. They determined that conservation of water resources, biodiversity, and forests has increased on certified farms compared to conventional coffee farms. Heilmayr & Lambin (2016) established a study looking at certification systems in the Chilean forestry sector. They found that compared to an industry driven certification scheme, and a moratorium on clear-cutting agreed to by some logging companies and NGOs, FSC certification was the most efficient in slowing forest conversion. DeFries et al. (2017) evaluated whether voluntary certification systems of tropical commodities (bananas, cocoa, coffee, oil palm, and tea) have achieved environmental, economic or social benefits. They found that for environmental outcomes, these certification systems either had a positive or non-significant impact.

However, research has also identified limitations of the certification process with regard to certification's ability to alter practices and outcomes. First, if a standard is not sufficiently stringent, companies may not have to change their practices to achieve certification. In this case, certification simply "greenwashes" products ((Environmental Investigation Agency and Grassroots, 2015; Waldman and Kerr, 2014). Second, certification systems may be unable to address core environmental and social concerns intrinsically related to the production of the product (Vogel, 2008), and may therefore produce no measurable changes in certain outcomes. For instance, Blackman & Rivera (2010) analyzed 14 credible studies of sustainability certification and found only six cases that generated positive environmental and socioeconomic

outcomes. In Indonesia, Silva-Castaneda (2012) found that the RSPO standard may not demand the change needed for social issues, and is focused more on physical forms of proof of the standard. Finally, smallholders or small producers, who often make up a large proportion of commodity production, are frequently excluded from certification because they face many obstacles (e.g., knowledge, cost, and resources) to becoming certified (Brandi et al., 2015; Getz and Shreck, 2006; Rueda and Lambin, 2013).

Third-party audits performed by independent certification bodies to ensure compliance with certification standards have also been critiqued (Russell, 2013). An audit is a systematic independent process for obtaining evidence and evaluating compliance with a set of criteria (ISO 19011:2011). The use of third-party audits has arisen largely due to the need to eliminate potential conflicts of interest between certification systems and entities seeking certification. The third-party system is viewed as more credible than first- or second party certification (self-auditing, or auditing by the standard-setting body, respectively) due to the independence of certification bodies from other participants in the agricultural supply chains and certification systems (Hatanaka & Busch, 2008).

Nevertheless, some challenge the claim that third-party audits are independent. For instance, in oil palm certification systems, recent reports by activist NGOs suggest high levels of collusion and corruption among auditors (EIA, 2015), which could lead to assessments that are neither fair nor robust. While auditors may not intentionally collude, they may have a hard time remaining objective and impartial, which could skew outcomes (Bazerman et al., 1997). Although accreditation of certification bodies by an international body supports impartiality (Manning & Baines, 2004), audit costs vary within global commodity markets, which may hinder the credibility and objectiveness of certification bodies (Anders et al., 2007). For example, Hatanaka & Busch (2008) found that each certification body has its own agenda (e.g., sustainability, maximizing profits), which affect both the thoroughness and cost of auditing. Finally, when the certification system itself provides weak guidance regarding expectations of producers, companies may instead rely on guidance from (relatively more supportive) certification bodies (Tanner, 2000).

Analysis of changes required by auditors is one way to understand the additional impact of certification beyond business as usual. Newsom et al. (2006) used analysis of audit reports to understand whether the SmartWood program of the Rainforest Alliance affected forest management outcomes in the United States. They found strong evidence that certified companies changed their forestry practices to comply with environmental and social criteria. In addition, they concluded that certified operations made quantifiable on-the-ground changes that led to more sustainable forestry practices. In FSC certified forests in Mexico, Blackman et al. (2014) analyzed corrective action requests (CARs) issued by auditors following inspections. They found that most CARs required only minor on-the-ground changes to environmental conditions, rather than major changes such as protection of rare species or maintenance of primary ecological functions. Moreover, they identified greater emphasis on correcting social and legal issues rather than environmental concerns. The authors speculate that that the prevalence of minor on-the-

ground changes required to achieve and maintain certification may be due to the fact the FSC program attracts landholders who already manage forests in a more "sustainable" fashion.

The RSPO relies on third-party auditing to ensure compliance with P&C so that products can be labeled as "sustainable." Changes made to comply with the P&C may generate improved environmental and social outcomes. Since effective auditing is the core of a robust certification system, reviewing changes in producer practices required by auditors is one way to understand the type and degree of changes that occur due to certification, and provides a mechanism to connect certification to changes in environmental and social outcomes. Such analysis can identify specific parts of the standard that demand the most change before achieving certification, as well as less stringent parts of the standard that most companies already comply with prior to certification. By comparing non-compliances to characteristics of companies and certification bodies while controlling for other factors that may influence certification, such analysis may suggest potential issues with third-party auditing such as collusion and corruption. In addition, such a review can illuminate issues that are apparently occurring (according to NGO reports or public perception) but not picked up through auditing. However, to our knowledge, there has been no formal examination of changes that RSPO-certified companies are required to make to become certified.

Project Aims & Significance

Given this lack of evidence regarding the changes that oil palm growers make to conform with the RSPO P&C, as well as factors that may affect the likelihood of change or detection of non-compliances, this research aims to investigate the changes made due to the RSPO third-party auditing process. Specifically, we address the following overarching questions:

1. To gain and maintain certification, how many and what kind of changes must RSPO companies make?
2. How do issues perceived by the public as problematic in the oil palm industry compare to on-the-ground problems verified by auditors?
3. Which factors, including actors involved in audits, influence any audit-induced changes?

To answer these questions, we compiled and analyzed data on non-compliances – cases in which a producer fails to conform with an RSPO criterion and must make a change to remain in compliance – from a sample of audit reports of certified companies. We evaluated producers in Indonesia, because the country is the leading producer of palm oil (40% of global production in 2014) and RSPO certified palm oil (71% of global production in 2017) (FAO, 2014; RSPO-Impacts, 2017). Results inform whether and how certification systems and the third-party auditing process drive environmental and social changes within plantations.

Methods

Supply Base Selection

As of March 31, 2017, there were approximately 69 RSPO certified member growers and smallholder groups, spanning 310 certified mills or smallholder producers across 15 countries, with a total certified area of 2.5 million hectares ("RSPO - Roundtable on Sustainable Palm Oil - Certification," 2016). We compiled a list of all RSPO certified properties from the RSPO website

(www.rspo.org). As of December 2015, Indonesia had approximately 176 RSPO certified entities, including 3 smallholder groups and 173 large-scale grower mills. Because most (98%) certified properties were located within Sumatra and Kalimantan (Indonesian Borneo), we limited our research to these regions. We focused only on large-scale growers. From the 170 large-scale growers in Sumatra and Kalimantan, we randomly selected 72% (116 mills) for analysis (Figure 2).

Principles & Criteria (P&C)

We analyzed audit reports that assessed producers against the 2007 or 2013 International Standard, or the 2008 Indonesian National Interpretation of the 2007 International Standard. The Indonesian interpretation references laws and regulations unique to Indonesia, but has the same Principles and Criteria as the International Standard. Auditors using the International Standard were likely to be aware of all local and national laws, and use of the National Interpretation is therefore unlikely to significantly affect the type and number of non-compliances detected. Thus, we considered the 2008 National Interpretation equivalent to the 2007 International Standard.

The 2007 and 2013 International Standards contain significant differences in content and reporting requirements. The 2007 International Standard is composed of eight Principles (Table 1) and 39 Criteria. The 2013 International Standard includes the original eight Principles, and saw the addition of four new Criteria including ethical conduct in business operations (1.3)), no forced or trafficked labor (6.12), respect of human rights (6.13), and design of new plantation developments to minimize gas emissions (7.8). Moreover, the 2013 Standard contains Indicators as evidence that Criteria are being met. Thus, the 2013 Standard has 43 Criteria which are measured by 129 Indicators. Indicators are pre-classified as Major or Minor infractions, although auditors sometimes re-categorized non-compliances despite these classifications. Due to the lack of Indicators in the 2007 International Standard, our main analysis considered only Principles & Criteria.

Certification Document Collection

The RSPO website hosts documents related to certification, which include assessments for initial certification, annual surveillance audits, and re-certification (every 5 years). For each selected supply base, we downloaded all assessments and certificates of conformance from this website. When a document was not available from the RSPO website, we searched for the document using the Google search engine (www.google.com), and requested the document from the RSPO secretariat.

Audit Data Collection

From these audit reports, we constructed a database of RSPO-certified mills and associated non-compliances. We also collected information about factors that may have an impact on the frequency and/or intensity of non-compliances, as suggested by our literature review. Specifically, we extracted information related to the auditing process, actors involved in auditing, and properties of the mill or supply base (

Table 2).

For non-compliances, we noted the intensity of the non-compliance (major or minor) to assess the degree of change that oil palm growers needed to make to gain or maintain certification. Major non-compliances must be resolved or "closed" within 60 days, and all major non-compliances must be closed to gain initial certification. For minor non-compliances, the producer has until the next surveillance assessment to comply, otherwise the issue will be raised to the major category. For each non-compliance, we recorded the time allotted to comply, time to actual compliance, and whether the non-compliance remained open or was resolved. We linked each non-compliance with a Principle and Criteria, and collected the text description of the non-compliance by copying and pasting it from the audit document. We also recorded textual descriptions of "observations," which highlight potential issues that do not fit into noncompliance categories outlined by the RSPO. The RSPO does not require identification or resolution of observations, but they are a way for auditors and the company to keep track of areas of improvement, and were included in many audit reports.

Identifying Types of Issues Addressed through Auditing

To identify the types of issues addressed through resolution of non-compliances, we classified non-compliances into 36 thematic areas, which were categorized into four general classes (environmental, social, legal, and management practices). Non-compliances in the environmental category were related to on the ground practices that may have had an impact on the surrounding environment. Social issues affect the humans involved in oil palm production as well as communities near the plantation. The legal category included non-compliances related to Indonesian laws and regulations. Finally, management practices are non-compliances related to the operation of the plantation and mill, whether these be actual practices or the documentation of these practices. We chose these classifications because they align with previous, similar studies (Blackman et al. 2014; (Newsom and Hewitt, 2005) and roughly follow the sustainability

three-part conceptual framework (environmental, social, and economic) (Our Common Future, 1987). By breaking the original eight principles into four overarching classes, we could understand which issues present the largest barriers to becoming RSPO certified. Moreover, because we analyzed audits against two different standards (2007 and 2013), classification allowed us to create our own understanding of non-compliance by eliminating potential bias introduced through the differences between standards.

To identify thematic areas, we used an Excel add-in called Etable Utilities (Thinkin in E, LLC, 2017) which enables the user to search for keywords within texts. With this utility, we generated a table with all frequently used words (words used more than 10 times within all noncompliance texts) and their frequency of use. We then eliminated non-informational words such as "their," "and," and "the.", which left us with approximately 100 words. We retained only words that were like the "thematic areas" in the Newsom et al. (2006) study (e.g., "HCV", "land use", "management plan"), and we were left with approximately 60 words (Figure 3). Finally, to reduce redundancy, we grouped similar words into 36 thematic areas. For instance, "peat", "erosion" and "soil" were grouped into the thematic area "soil", because they all related to issues around soils. In instances when multiple thematic areas were detected for one non-compliance, we read the textual description and selected the thematic area that we felt represented the main reason for the non-compliance. Approximately 300 non-compliances (11%) required manual evaluation. We compared the number of non-compliances per Principle or Criteria to the number of non-compliances per thematic area, and assessed the average number of days resolve non-compliances in each category and thematic area.

We also compared thematic areas with issues surrounding the palm oil industry and RSPO certification based on internet queries. Using the Google search engine (www.google.com), we ran queries of "roundtable on sustainable palm oil" & "XX" (where XX is the thematic area, e.g., "high conservation value"). We searched for all 36 thematic areas on July 2, 2017. This analysis was conducted to understand whether the most frequent issues addressed through auditing are correlated with the most commonly perceived issues related to the RSPO. We performed linear regression analysis to test how well the number of non-compliances in a thematic area related to search results.

Statistical Analysis

All statistical analysis was performed in R (Core Team, 2013). To understand and guide the analysis, we examined basic summary statistics for each of 12 factors that may influence audit outcomes (i.e., RSPO member, certification body, audit type, RSPO standard, supply base, initial plant year, year of certification, effort, province, lead auditor, number of auditors, and supply chain model). Using linear mixed effects models, we then explored relationships between the frequency and type (major or minor) of non-compliances and these factors. To guide variable selection for these mixed models, we performed a LASSO regression using the glmnet package (Friedman et al., 2010) with all 12 factors as predictors of the total number of non-compliances. Using the glmnet function to fit our data, with optimal lambda and minimal shrinkage, we could estimate the model. Using factors choses based on our LASSO model results, we then built three mixed effects models using the lmer4 package (Bates et al., 2015). Our first model examined

total non-compliances, and included major or minor non-compliance categories as a predictor variable, so that we could understand significant differences between the type of non-compliance. Models 2 and 3 assessed the same fixed and random parameters but response variables were major non-compliances and minor non-compliances, respectively. Because observations do not require changes to be made to maintain certification, in our analysis, observations were considered separately from non-compliances. We carried out analysis of variance tests using the car package (Fox and Weisberg, 2011) to assess the influence of various predictor variables on the number of non-compliances. Tukey's HSD post hoc tests using the multcomp package (Hothorn et al., 2008) were used to understand differences between categorical predictor variables.

Results

Trends in RSPO Audits

Selected mills were representative of RSPO certified mills in Indonesia. They spanned ten provinces, with 55% located in provinces of Central Kalimantan, North Sumatra, and Riau. Our sample included 29 RSPO members and eight certification bodies. Three certification bodies conducted >60% of audits in our sample. These companies were MUTU (34%), Control Union (16.5%) and TuvRheinland (16.5%). The number of auditors averaged 4.22 ± 0.97 individuals per audit (mean ± standard deviation of the sample mean), and they required about 0.06 ± 0.12 days per hectare of supply base to complete each audit. On average, plantation supply bases were initially planted to palm oil in 1994, and achieved certification in 2014.

For the 116 certified mills considered in this study, we analyzed 103 initial certification reports, 142 annual surveillance reports, and eight re-certification reports. To maintain certification, companies had to resolve 1723 non-compliances listed in these audit reports. Reports also identified 984 observations. By comparing the number of audit reports in our database with the number of audit reports that our sample of RSPO certified mills should have, we found that our database included 83% of all audit documents (Figure 4). Certified mills were required to address an average of 3.3 ± 4.3 total non-compliances per audit. They incurred fewer major non-compliances (2.9 ± 3.8 audit^{-1}) than minor non-compliances (3.7 ± 4.7 audit^{-1}). In addition, about 3.9 ± 4.8 "observations" were described in each audit.

Issues Addressed through Auditing

The total number and severity of non-compliances varied among RSPO Principles (**Error! Reference source not found.**). Best management practices (Principle 4) comprised 38% of total non-compliances. Companies were also required to make a substantial number of changes in the categories of environmental and social responsibility (Principles 5 and 6, 21% and 20%, respectively). For these three Principles (i.e., best management practices, environmental responsibility, social responsibility), minor non-compliances accounted for most (64%) required changes. Principles regarding laws and regulations (Principle 2) and transparency, economic viability, responsible development of new plantings, and commitment to continuous improvement (Principles 1, 3, 7 and 8) accounted for 14% and 7% of all non-compliances, respectively. For these five Principles, 70% of non-compliances fell into the "major" category.

The number and severity of non-compliances per principle could simply be a function of the number and type of criteria and indicators associated with that principle. We compared non-compliance frequency with the number of criteria or indicators per principle, and found a positive relationship between the number of non-compliances, and the number of criteria per principle ($p = 0.035$, $r^2 = 0.28$) and indictors per principle ($p = 0.017$, $r^2 = 0.64$). Principle 7, related to responsible development of new plantings, tended to have relatively fewer non-compliances than the other Principles (Figure 6).

We found that RSPO certification demands the most changes in the social category (39%), followed by plantation management (28%), environmental practices (20%), and legality (13%, Figure 7). Thematic areas associated with the most non-compliances were health and safety (9.4%), waste (8.7%), and training (5.0%). These three thematic areas yielded 33,500, 25,900, and 29,500 Google search hits, respectively. The thematic areas with the fewest non-compliances were fire (0.6%), fertilizer (0.8%), and business plans (1.3%). However, these thematic areas generated 21,200, 40,800, and 11,800 Google search hits, respectively. We found that the number of non-compliances per thematic area are not significantly related to the google search results ($r^2 = 0.00$, $p = 0.8080$, Figure 8).

Resolution of Non-compliances

About 90% of major non-compliances were reported as resolved. The remaining 10% were either closed after the allotted time, not reported as closed, still open, or downgraded to a minor non-compliance. Just 61% of minor non-compliances were closed within a year of detection, even though companies are theoretically given just one year to resolve these issues. About 25% of minor non-compliances remained open as of December 2015 (Figure 9).

We were able to calculate the time to closure for approximately 49% (1,326) of all non-compliances in our database. The average time to close a major non-compliance was 63 ± 80 days, while minor non-compliances required 191 ± 206 days to resolution. The average time to closure for major non-compliances lies just outside the 60-day RSPO requirement, but the average days for minor non-compliances falls well within the RSPO required to maintain certification. However, we are missing information from more than half of the non-compliances in our database, either because of a lack of information in the reports, or because these non-compliances were not resolved during the study period.

For major non-compliances, the time for closure did not differ substantially between our sustainability categories. Management issues required the most time for closure (67 ± 73 days) followed by social (66 ± 96 days), legal (63 ± 74 days), and environmental (56 ± 67 days) issues. Minor non-compliances regarding social issues required more time for closure (237 ± 218 days) than management (169 ± 199 days), legal (157 ± 190 days), or environmental (151 ± 183 days) issues.

The top ten thematic noncompliance areas (unions, integrated pest management, female workers' rights, road issues, workers' contracts, fire, communities, health and safety, social impact assessment, and emergencies) required an average of 71 days to close major non-compliances and 246 days to resolve minor non-compliances. Major non-compliances related to

social impact assessments and workers' rights required the greatest average days to close (84 ± 149 days and 78 ± 85 days, respectively). Minor non-compliances related to integrated pest management and unions required the most time to resolve (400 ± 370 days and 315 ± 217 days, respectively). The ten least common thematic areas (energy, fresh fruit bunches, smallholders, conversion to oil palm, legal boundaries, high conservation values, flora & fauna, personal protective equipment, water issues, and conflict resolution) required an average of 43 days to close each major non-compliance and 116 days to close each minor non-compliance. Major non-compliances related to fresh fruit bunches and legal boundaries required the fewest average days to close (16 ± 12 days and 28 ± 25 days, respectively). Minor non-compliances related to energy and conversion of forest to oil palm required the fewest average days to close (4 ± 2 days and 22 ± 27 days, respectively).

Factors Affecting Non-compliance Identification

LASSO regression set coefficients for several variables to zero (i.e., RSPO standard, supply base, initial planting date, province, lead auditor, and supply chain model variables coefficients) We eliminated these variables from our mixed effects models to reduce potential collinearity between variables, avoid overfitting, and improve ability to interpret models.

RSPO member, audit type, and effort were all significant ($p < 0.05$) predictors of total non-compliances (Table 4). Producers were required to make the most changes to their practices during initial certification, with fewer non-compliances in annual surveillance audits and at re-certification (Figure 10-A). Initial certification and re-certification typically involve more thorough auditing than annual surveillance, which is intended to monitor past non-compliances and review continuous improvement. Effort was positively related to the number of non-compliances, suggesting that the more time auditors spend at a supply base, the more likely they are to detect non-compliances (Figure 10-D).

While RSPO member was a significant predictor of both major and minor non-compliances, we detected some differences in predictors of minor versus major non-compliances. Specifically, while minor non-compliance frequency was associated with the certification body conducting the audit and positively related to auditing effort, major non-compliances were unrelated to these factors. Moreover, the audit type (e.g., initial certification, re-certification) was an important predictor of major, but not minor, noncompliance detection. The year of certification update was positively and significantly associated with both major and minor non-compliances, but not the total number of non-compliances. We also built models to assess predictors of auditor observations. We found that the number of observations was significantly related to the RSPO member, year of certification update, certification body, and effort. When we tested for differences between the number of each type of non-compliance, we found that major non-compliances were less frequent than minor ones ($p = 0.03$) (Figure 10-B).

Certain certification bodies and RSPO members stood out in terms of noncompliance frequency. PT Perkebunan Nusantara III had significantly more non-compliances compared to other members including Cargill Incorporated, Golden Agri-Resources Ltd, Goodhope Asia Holdings Ltd, PT Agrowiratama, PT Berkat Sawit Sejati, PT Ivo Mas Tunggal, PT Musim Mas, REA Holdings PLC, and Wilmar International Ltd (Figure 11). We found that Sucofindo

identified significantly more non-compliances per audit than all other certification bodies (Figure 12). We also found that the second and third annual surveillance assessments had significantly fewer non-compliances than initial certification assessments.

Discussion

Through analysis of data provided in audit reports, we investigated the changes that oil palm companies made due to the RSPO third-party auditing process. We found that RSPO certified plantations did change certain practices and conditions to become certified, and that they typically resolved issues within or near the timeframe required by the RSPO. Since we were unable to identify changes to practices made in preparation for certification but before the auditing process, our results are likely an underestimate of total change.

Several major concerns surrounding palm oil production include deforestation, declines in biodiversity, greenhouse gas emissions, and abuse of indigenous and community rights (Bush et al., 2015; Carlson et al., 2012; Carlson et al., 2014; Danielsen et al., 2009; Koh et al., 2011; Marlier et al., 2015; McCarthy et al., 2010; Sheil et al., 2009). These issues are frequently cited in high-profile campaigns by NGOs such as Greenpeace and Rainforest Action Network (Greenpeace International, 2017; Rainforest Action Network, 2013). Similarly, our internet search indicated that environmental issues were of greatest interest to the global English-speaking public when it comes to RSPO certification. In contrast, our re-classification of non-compliances indicated that the RSPO demands the most change to social issues like health and safety, followed by plantation management, environmental practices, and legal issues. Moreover, social and management issues required the most time to resolve. The most frequent non-compliances fell into health and safety, waste, and training thematic areas, while issues such as fire and deforestation were rarely detected as non-compliances. Thus, it seems that plantations that become RSPO certified do not typically have to overcome these debated environmental challenges. Problems with plantation management may be overlooked by NGOs and journalists when reporting about or campaigning against the oil palm industry, or they may be so minor that they are not considered sufficiently problematic to warrant international attention. These results may also be driven by self-selection into the RSPO; companies may choose to become certified because they are already largely in compliance with the P&C, with only a few social and management issues that are less expensive to deal with then environmental issues.

Our finding that RSPO certification addresses mainly social and management issues adds to a growing understanding that the changes that growers must make to their practices is highly context dependent. For instance, Newsom et al. (2006) and Lewis & Davis (2015), found that in the most commonly addressed issues for FSC Smartwood certification and Malaysian Timber Certification Scheme (MTCS) were related to management and ecological issues, respectively. In FSC certified plantations in Mexico, Blackman et al. (2014) found that social and economic issues demanded the most corrective action requests. In FSC forest management units in Brazil, Lopez-Ridaura (2005) found a high frequency of non-compliances related to health and safety. Issues addressed by certification are likely to be influenced by standard design (e.g., standards accredited by the International Social and Environmental Accreditation and Labeling (ISEAL), stringency, commodity (e.g., timber versus oil palm) (DeFries et al., 2017), and region (e.g.,

Indonesia versus the United States)(Garrett et al., 2016; Newsom et al., 2006). Indeed, our finding that the number of non-compliances per Principle is positively related to the number of Criteria or Indicators per Principle suggests that the format of the written standard is a driving force that underlies the types of issues identified through certification.

Like Newsom et al.'s (2006) analysis of the FSC Smartwood program, we found that non-compliances tended to decrease over time since initial certification. Non-compliances declined from an average of 4.8 non-compliances at initial certification to 3.3 non-compliances at re-certification. This finding suggests that issues identified through auditing are being resolved by the company, but also that new issues are detected or arise over time. Unless these new non-compliances were associated with assessment against a new standard, they might be considered "backsliding," or becoming non-compliant after passing an initial audit (Tlusty & Tausig, 2014). Backsliding could be a true decline in farm practices, but could also be due to variation between auditors, detection of issues that were present but not detected in a previous audit, or raising an "observation" to a non-compliance. Both the RSPO and FSC standards include a Principle related to continuous improvement that requires the supply base to continuously update practices. If indeed auditors raised "observations" to non-compliances, this would support oil palm growers in continuing to work towards better practices, although it could also indicate heterogeneity in the practices associated with production of RSPO-certified palm oil (that is, not all producers are held to the same standards in the same year). Regardless, the fact that auditors continue to detect non-compliances through time suggests a critical maintenance role of annual audits.

Gaining and maintaining RSPO certification is costly. Companies must pay RSPO membership dues, auditing fees, and adhere to practices that may go above and beyond their non-certified peers. We found that total non-compliance frequency was correlated with RSPO member, which suggests that each RSPO member has a different "cost of compliance." In 2012, initial certification was estimated to cost between $2.13-3.54 per hectare, and the cost of correcting non-compliances ranged from $3.74-10.99 per hectare (WWF, 2012). In 2008, the estimated land use return for large scale oil palm plantations in Indonesia was $3340 per hectare (Grieg-Gran, 2008), although returns fluctuate as the price of palm oil changes. Thus, the costs of certification and correcting non-compliances appear to be small compared to profits of large-scale plantations (<1% of land use return for a large plantation). Nevertheless, companies with the most non-compliances per audit (e.g., Bumitama, PT Gawi Makmur, and PT Sawit Sumbermas Sarana) may pay significantly more to become certified than companies with very few non-compliances per audit (e.g., PT Berkat Sawit Sejati, PT Agrowiratama, and PT Ivo Mas Tunggal), and could also represent companies at the margin where the benefits of certification outweigh the cost of compliance.

We found that the certification body, effort, and the number of auditors were significant predictors of minor non-compliances, but not major non-compliances. The fact that major non-compliances are un-related to certification body suggests that when it comes to major issues, certification bodies are implementing the standard with similar stringency; any certification body would identify the same number of major issues, all else equal. Moreover, major issues are

apparently detectable despite different effort and number of auditors present (audit intensity). This suggests, but does not guarantee, a lack collusion and corruption regarding major non-compliances. On the other hand, the statistically significant relationships between certification body, increasing effort, increasing number of auditors, and minor non-compliance frequency may be a sign that minor non-compliances are dependent on the certification body and audit characteristics. Thus, palm oil certified during more intensive audits, and by particular certification bodies, may be associated with a greater degree of compliance with the RSPO P&C than other certified palm oil. The RSPO allows for members to choose from a selection of qualified certification bodies. Companies with more financial resources may choose a more costly certification body to gain control over when, and to what extent, the certification body oversees their operations (LeBaron et al., 2017). However, companies with fewer financial resources may not have a choice, and instead simply accepting the lowest bidder. Thus, more intensive audits may not necessarily be associated with the price of the audit, but this relationship remains untested in the RSPO certification system.

Conclusion

NGOs have questioned whether oil palm growers change their practices under certification, and consumers with preferences for "green" products wish to know whether RSPO certified palm oil is "sustainable." If the RSPO standard is not sufficiently stringent, if auditors do not identify non-compliances occurring within certified plantations, or if companies do not actually change their practices in response to audits, then RSPO certification may result in no on-the-ground change. Prior to this work, to our knowledge, no research had examined oil palm plantation management changes made through certification, despite frequent accusations of "greenwashing." To inform these debates, we investigated how the third-party auditing process within the RSPO certification leads to change in practices by and conditions under large-scale oil palm growers. Like research on certification of other similar land-based commodities, our findings suggest that the RSPO certification system does lead to changes in practices and conditions, potentially with positive environmental and social outcomes in these complex systems. While our research cannot detect cases where auditors chose not to report or could not detect non-compliances by oil palm companies, our results advance understanding of the impacts of certification on the oil palm sector.

Our research suggests a number of improvements that the RSPO can make to improve the effectiveness of their certification system. First, they can more closely monitor the auditing process. All RSPO members should have easy access to auditor findings, and grower responses to auditor requests, because this information forms the basis for sustainability claims under RSPO certification. Thus, we suggest that the RSPO track non-compliance detection and resolution in a publicly available database. Such a database would have several benefits. Auditors and supply base managers could easily track their progress (and remaining issues) over time. This database would also contribute to the RSPO's commitment to transparency, and enable further investigations into what on the ground changes are made by certified companies to inform standard revisions and improvements to the auditing system. Second, we faced several difficulties in compiling data from audit reports, including several missing reports, lack of data

on the time to resolution of non-compliances, and the mundane issue of extracting data from these PDFs. Thus, to support construction of a database, we recommend that the RSPO require certification bodies to conform to a uniform format for reporting audit results. Third, we found that the number of Criteria and Indicators per Principle were important in predicting the number of detected non-compliances. Thus, we recommend that during revisions of the P&C, the RSPO membership carefully consider which Criteria and Indicators they wish to include in the new standard, as these will likely determine outcomes under certification. Finally, given that the audit effort seems to have an important effect on the "minor" changes that oil palm growers must make, we suggest that the RSPO consider setting a minimum effort level to improve homogeneity of auditing stringency.

Looking forward, oil palm certification will need to adapt to new demands by industry and civil society, as well as changes in state governance, over time. In addition, the RSPO P&C Standard is reviewed and revised every five years. To support these adaptations, we encourage ongoing independent research on the RSPO certification system's auditing process, because such research provides one critical source of information about the benefits of the RSPO beyond business as usual, as well as remaining shortcomings of the P&C and auditing process.

Figures

Figure 1: Structure of the accredited third-party audits and RSPO certification program. The RSPO certification program is responsible for recognizing accreditation bodies (in this case, Accreditation Services International), the authorities that approve third-party certification bodies and auditors. An accredited certification body is an agency that has been recognized by an accreditation body to be able to conduct audits for the RSPO. A third-party auditor is an individual that has been approved by a certification body to conduct audits for the RSPO.

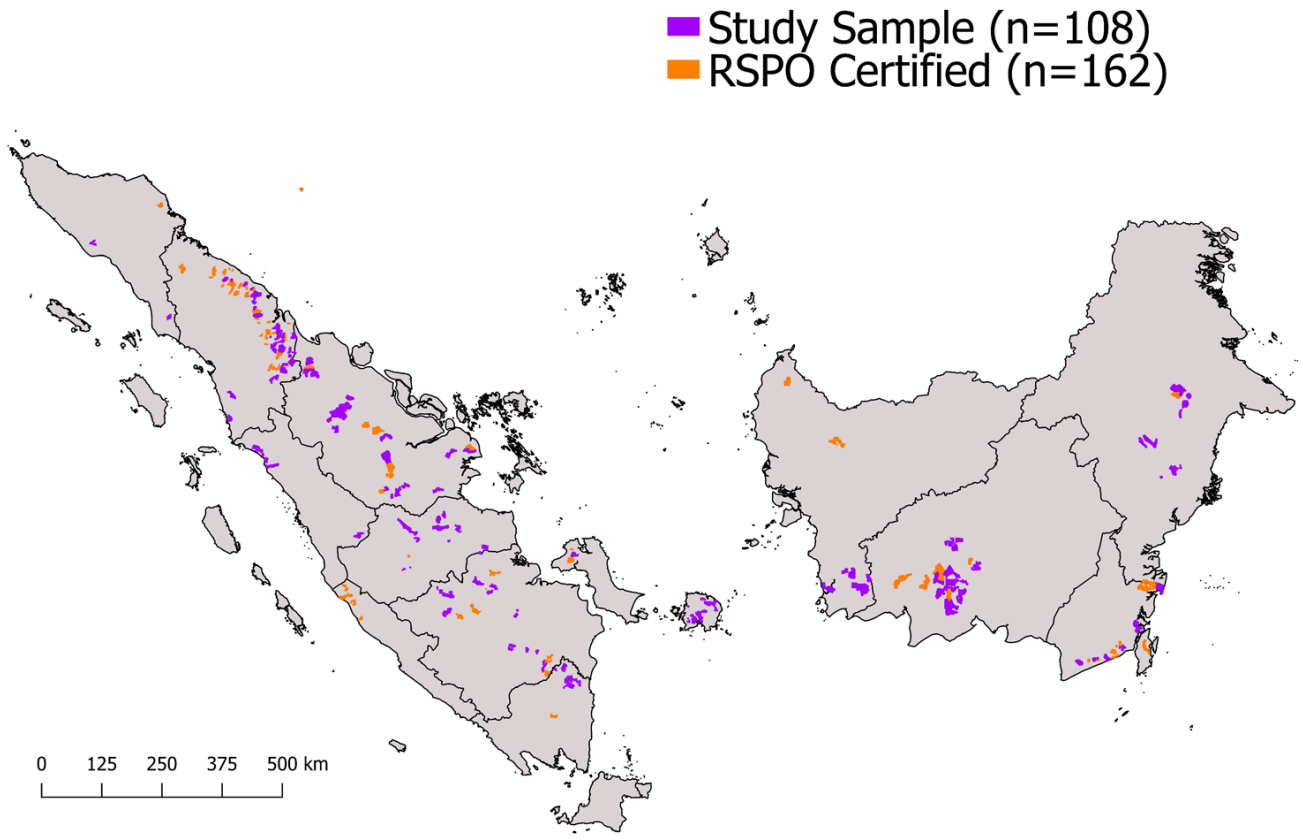

Figure 2: Roundtable on Sustainable Palm Oil (RSPO) certified plantations used for this study, as well as other RSPO certified plantations within Sumatra and Kalimantan (Indonesian Borneo) (162). This map includes just 108 of the full 116 certified plantations included in our study sample, due to lack of boundary data for remaining eight plantations.

Environmental	Social	Legal	Plantation Management
• Agriculture • Environmental Impact Assessment (EIA) • Energy • Erosion • Exotic pests • Fertilizer • Fire • Forest • Greenhouse gas • High Conservation Value Areas (HCV) • Invasive plants • Peat • Pesticides • Pollution • Flora & Fauna • Rare, Threatened and Endangered Species (RTE) • Regeneration • Soil • Water	• Communities • Conflict Resolution • Contracts • Cultural sites • Female Workers • Health • Housing Facilities • Occupational Health & Safety (OHS) • Personal Protective Equipment (PPE) • Pregnancy • Safety • Social Impact Assessment (SIA) • Smallholders • Training • Union • Wages • Work Contracts • Workers	• Business Plan • Compliance • Fresh Fruit Bunches (FFB) • Price • Laws • Legal • Legal Boundaries • Land Use • Land Tenure • Maps • Profitability • Regulations • Traditional rights ownership	• Conversion to Oil Palm (OP) • Documents • Emergency • Risk • Equipment • High Conservation Value Areas (HCV) • Integrated Pest Management (IPM) • Monitoring • Implementation • Recycling • Reports • Roads • Standard Operating Procedures (SOP) • Waste • Waste Water Treatment Plant (WWTP)

Figure 3: The most common words from the non-compliance textual descriptions (approx..60) which were then narrowed down into 36 thematic areas.

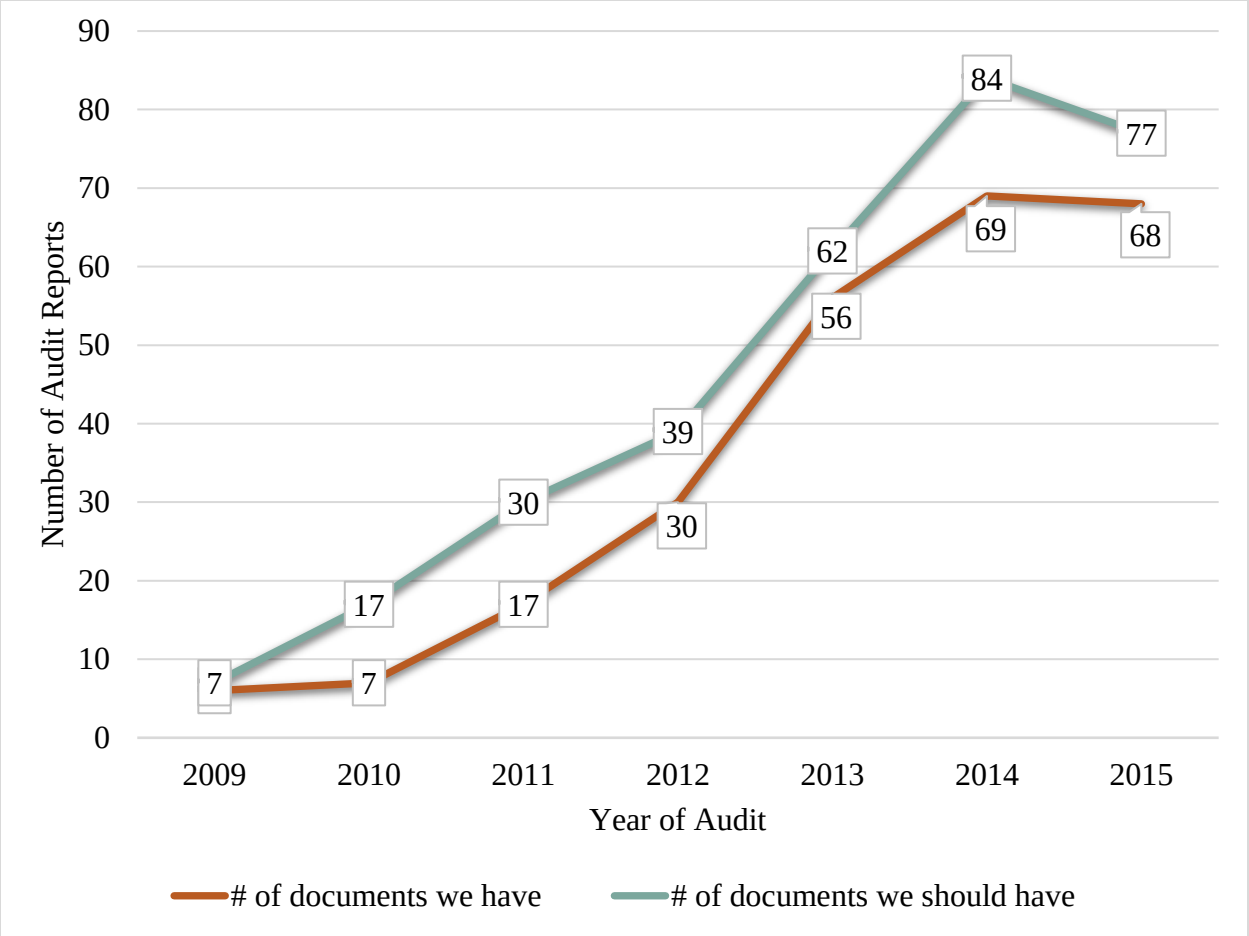

Figure 4: Availability of Roundtable on Sustainable Palm Oil (RSPO) audit report documents. Overall, we hold 80% of all audit reports for our sample of 116 RSPO-certified plantations in Indonesia.

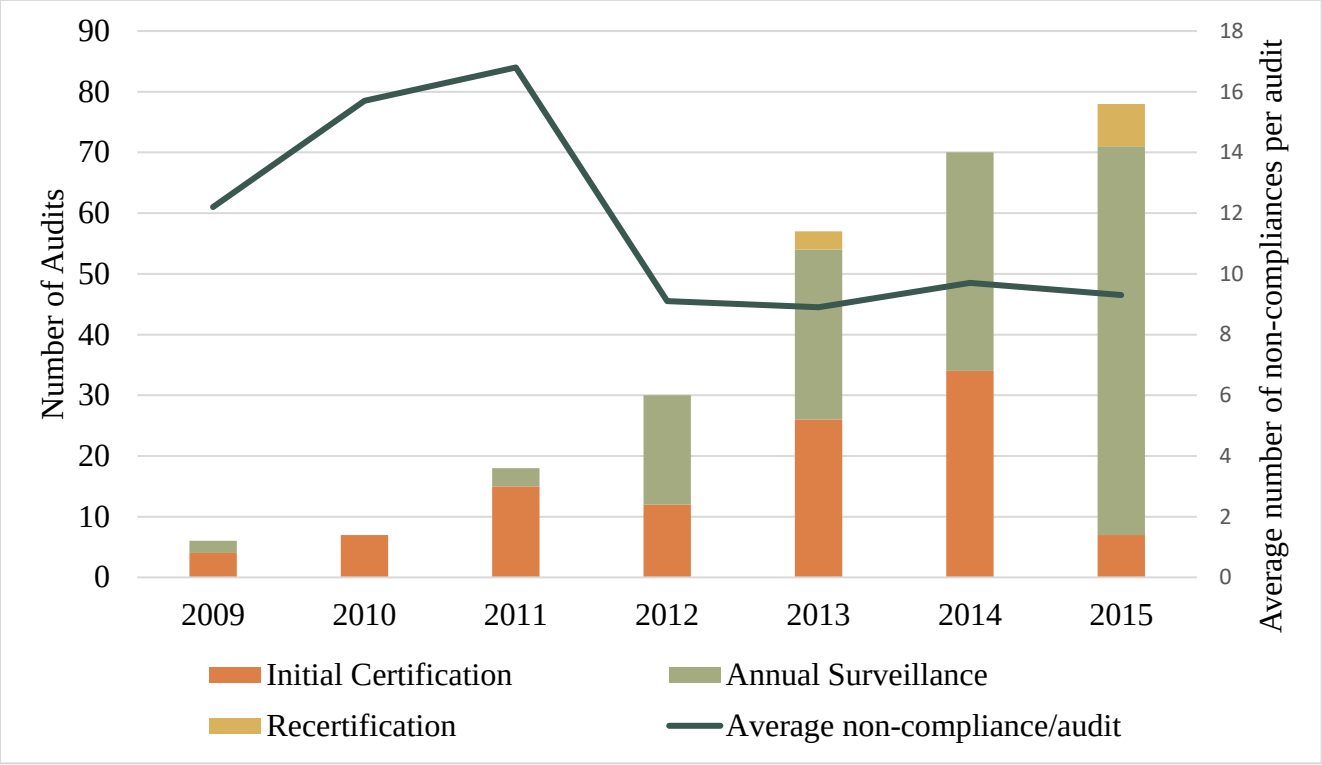

Figure 5: The annual number of Roundtable on Sustainable Palm Oil (RSPO) audit reports (n = 266 across all years) for sampled plantations, and the average annual number of non-compliances per audit report from 2009 to 2015.

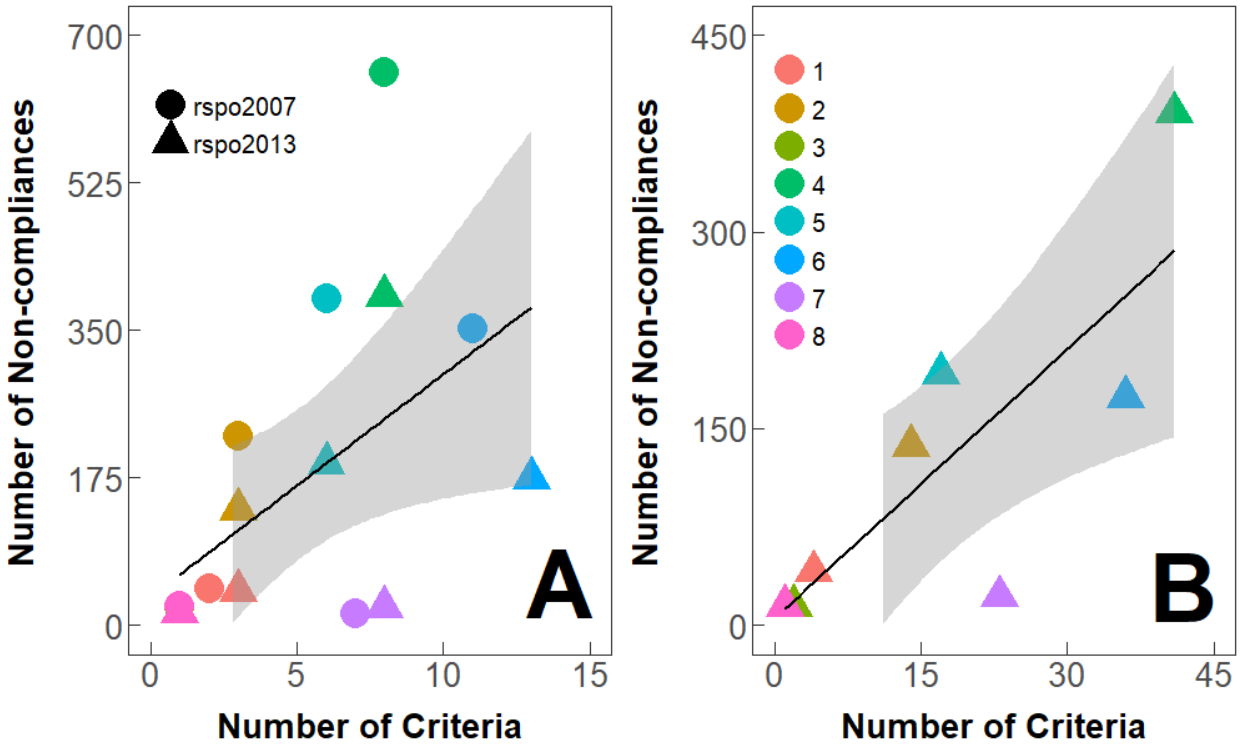

Figure 6: The number of non-compliances identified in Roundtable on Sustainable Palm Oil (RSPO) reports, compared to A) the number of Criteria and B) the number of Indicators for 2013 Standard. Principle 7, related to the responsible development of new plantings, had relatively fewer non-compliances compared to number of criteria, whereas Principle 4, related to best practices, had relatively more non-compliances compared to number of criteria. Circles and triangles represent 2007 & 2013 RSPO Standards; colors represent RSPO Principles 1-8 (1 = transparency, 2 = compliance with laws, 3 = financial sustainability, 4 = best practices, 5 = environmental responsibility, 6 = social responsibility, 7 = responsible development of new plantings, 8 = continuous improvement).

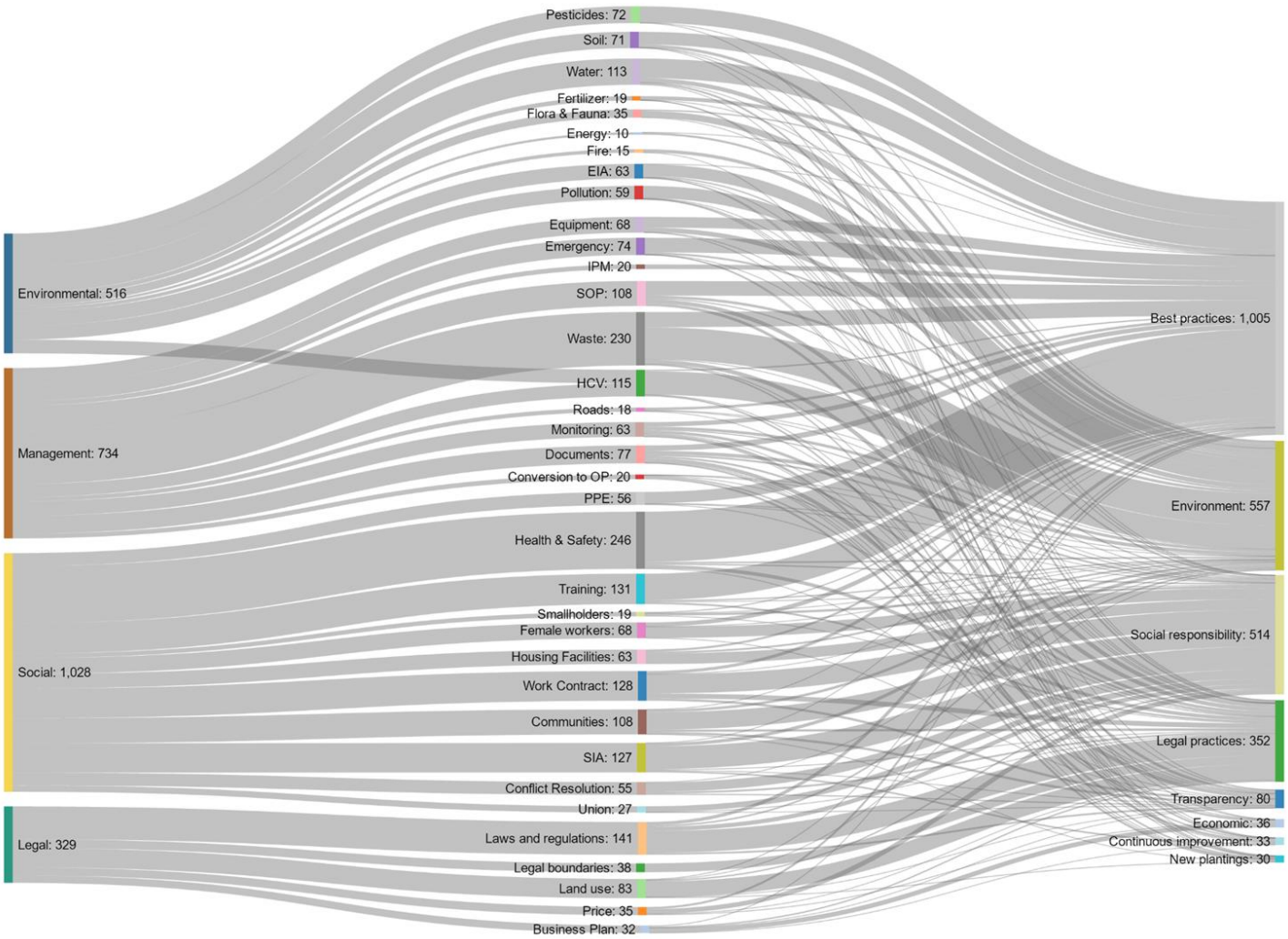

Figure 7: Relationship between non-compliance category (left) and thematic area (middle) as reclassified in this study, and original RSPO Principle (right).

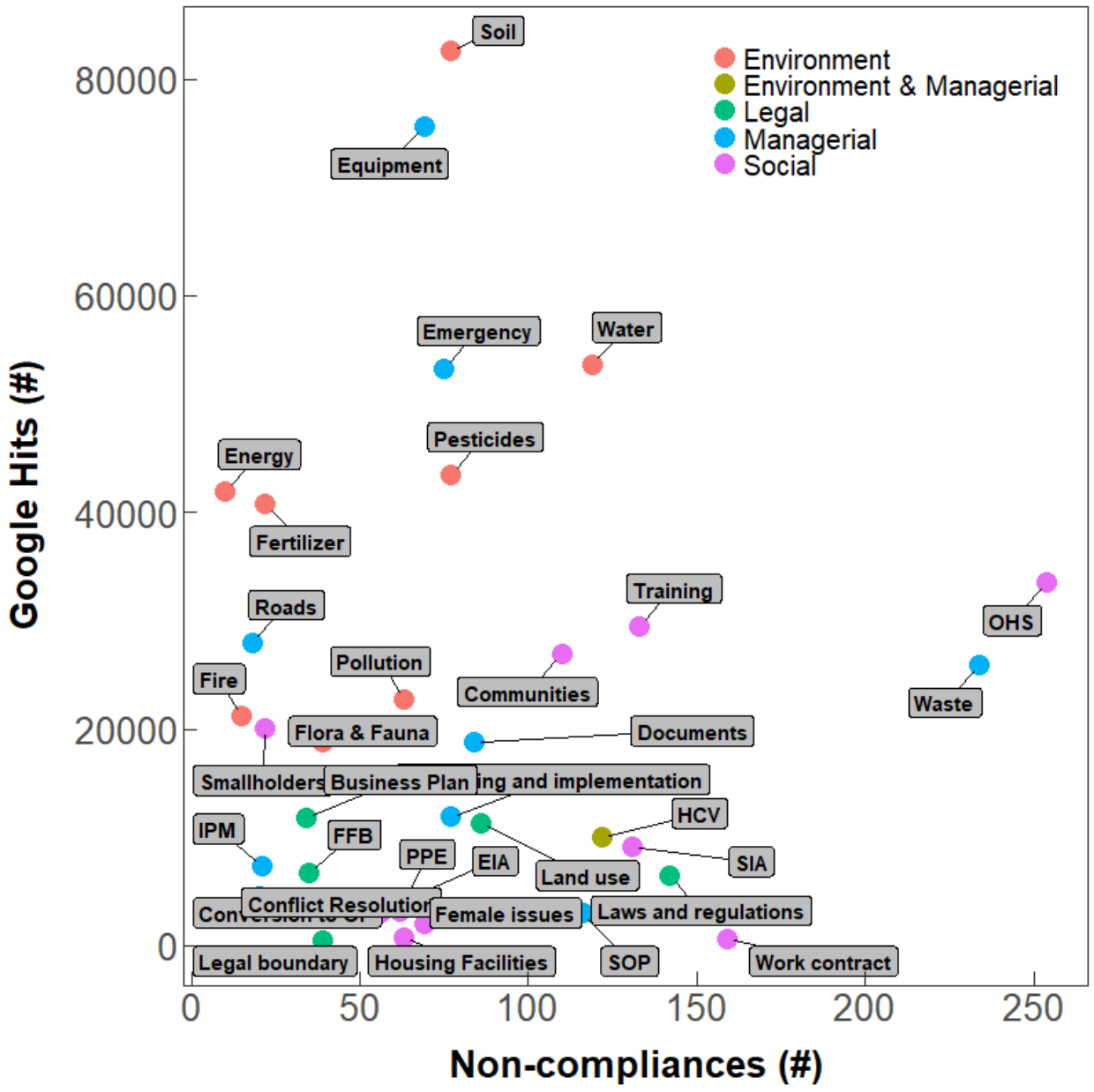

Figure 8: The total number of non-compliances for thematic areas compared to a Google search result for ("roundtable on sustainable palm oil" & "thematic area").

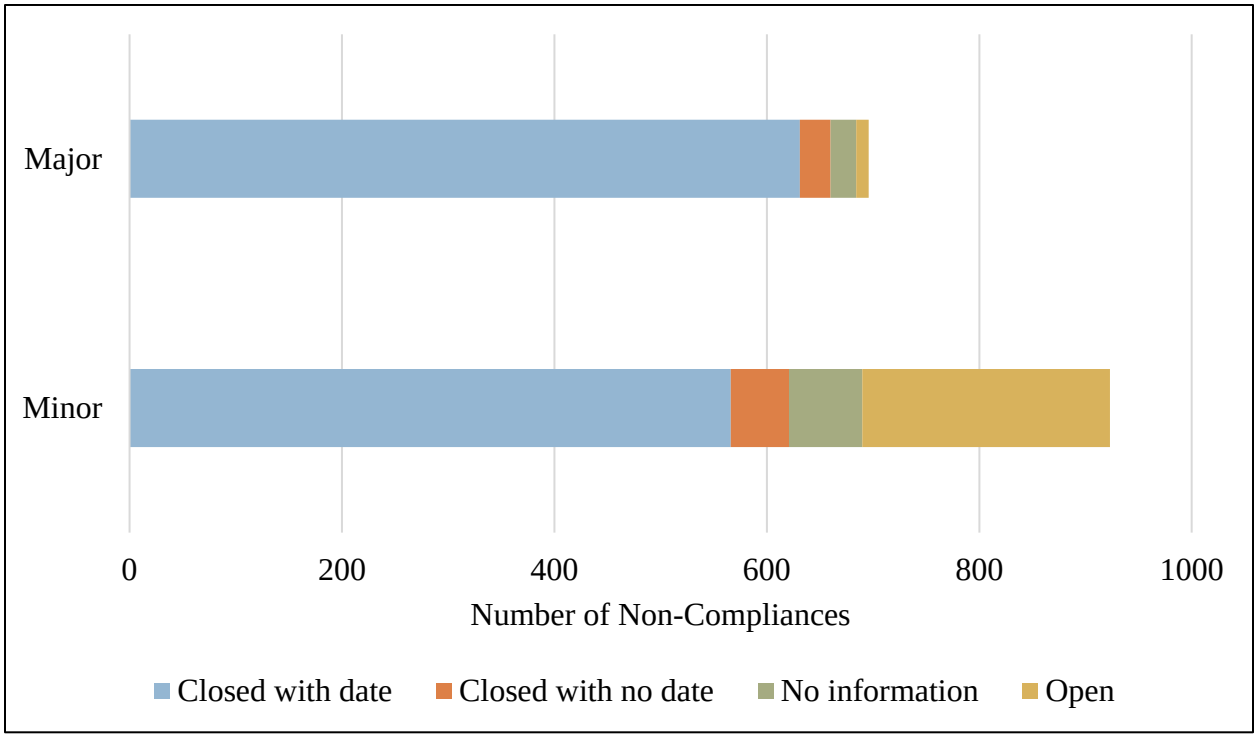

Figure 9: Degree to which non-compliances identified during RSPO audits have been addressed by Dec 31, 2015. According to RSPO rules, major non-compliances must be addressed or "closed" within 60 days, while minor issues should be closed within a year of the audit. About 95% of major and 68% of minor non-compliances across all audits have been closed. Approximately 25% of minor non-compliances occurred in the year 2015, which may reflect the larger proportion of open non-compliances as they still have time to close.

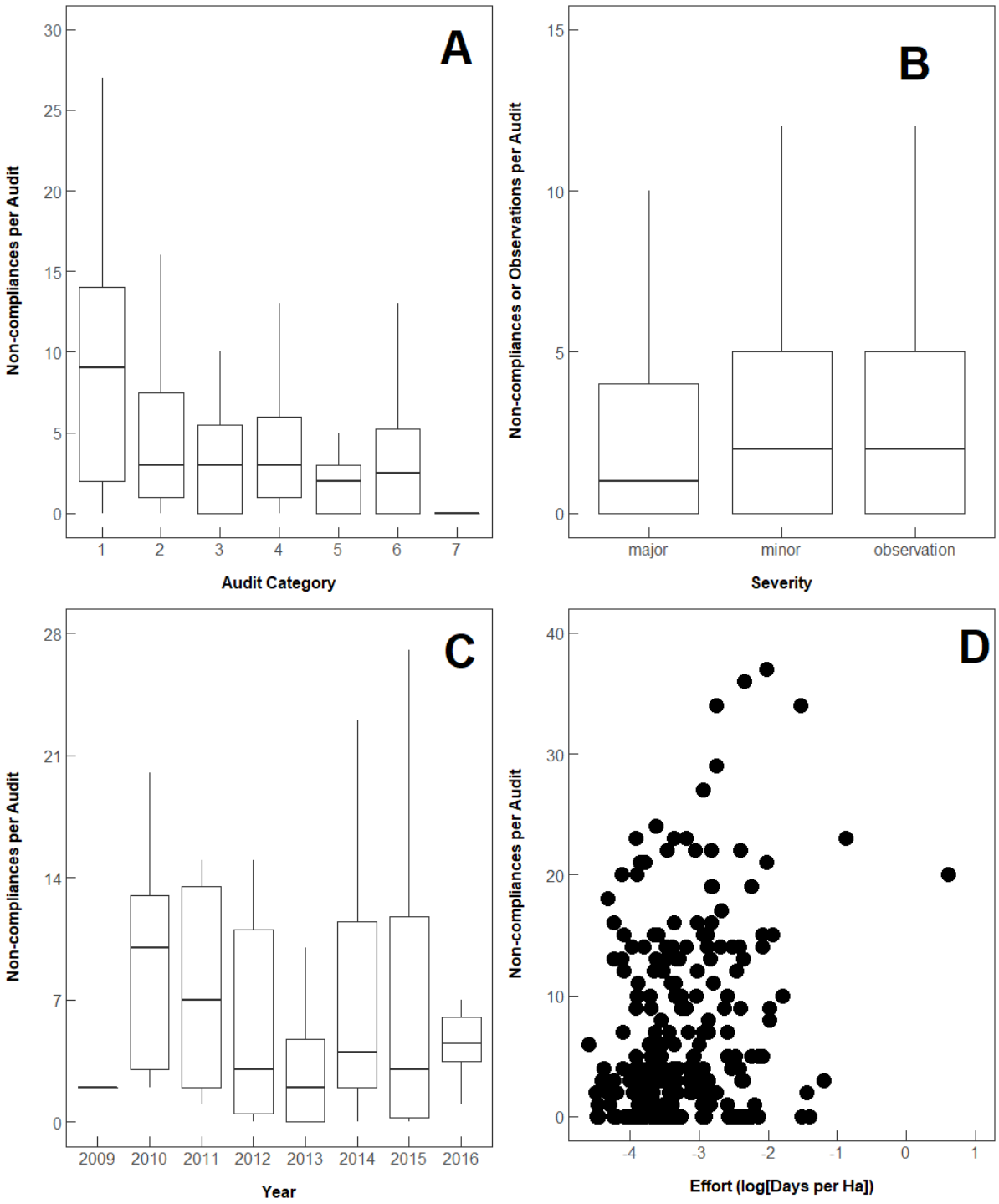

Figure 10: Relationship between the number of non-compliances and/or observations per audit and A) Audit category, including initial certification (1), annual assessments (2-4, 6-7), and re-certification (5), B) Severity of non-compliance (major, minor) or observation, C) Year of certificate, and D) Log-transformed auditing effort (days/area) Data were derived from n = 254 audits. For the box and whisker plots the box represents the interquartile range, where the median is represented by the line within the box. The whiskers represent the maximum and minimum values.

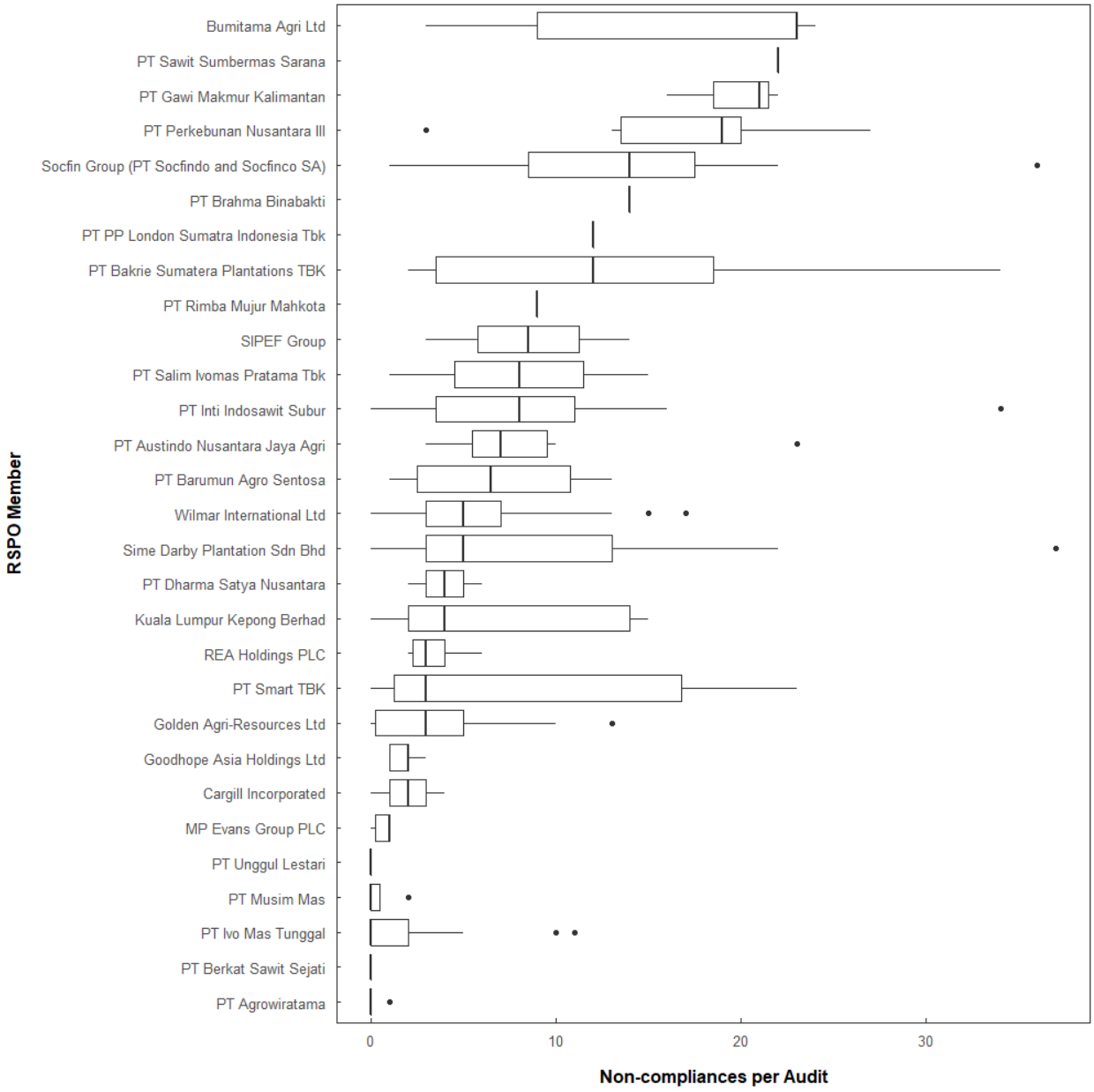

Figure 11: The number of non-compliances per audit, by RSPO Member. The box bounds the interquartile range for each member. The line within the box represents the median non-compliances per member. Tukey-style whiskers extend to the minimum and maximum values for each member excluding any outliers. The dots represent the outliers present for each member (greater than 3/2 time of upper quartile, or less than 3/2 times of lower quartile)

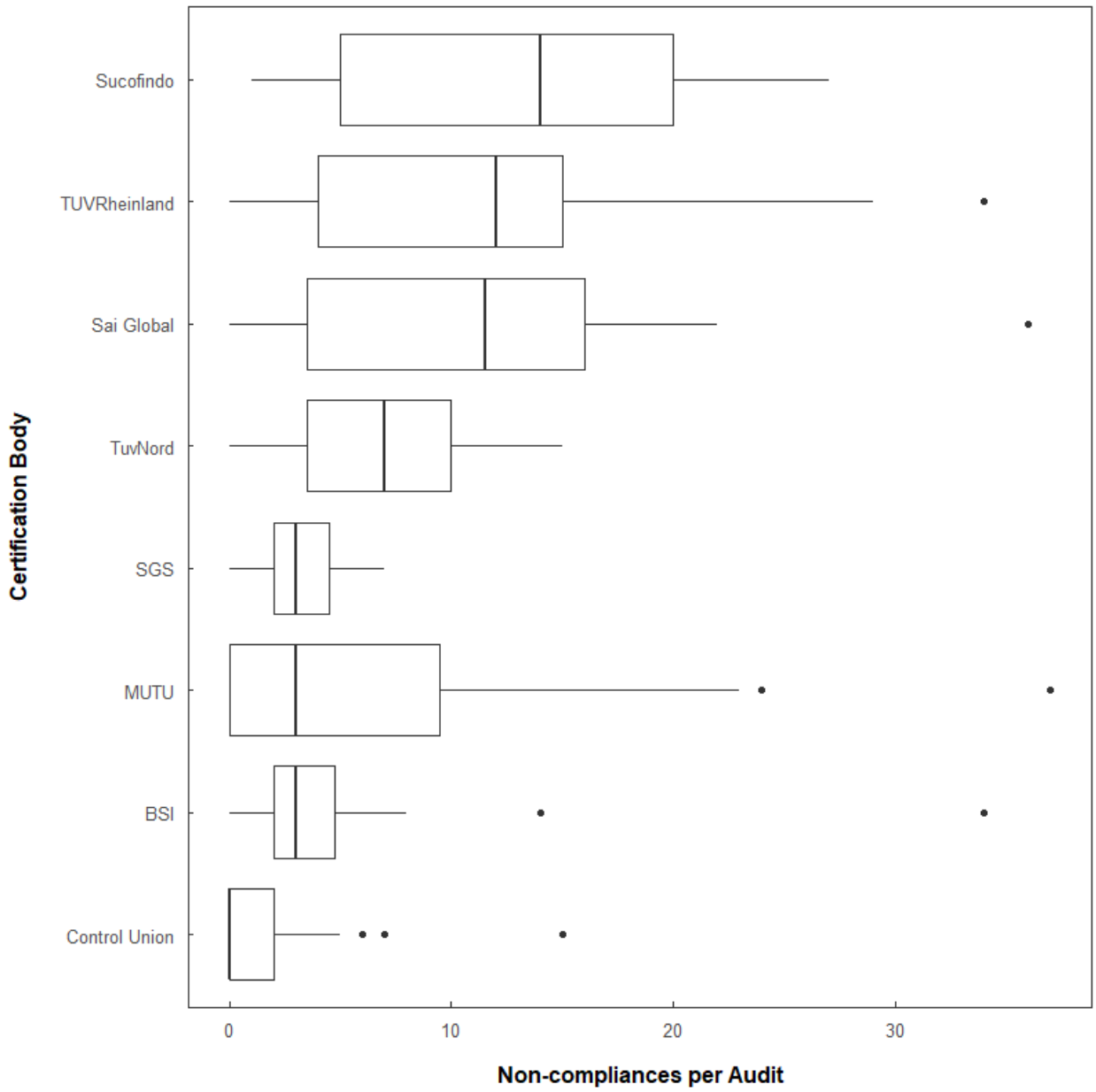

Figure 12: The number of non-compliances per audit, by certification body. The box bounds the interquartile range for each certification body. The line within the box represents the median non-compliances per certification body. Tukey-style whiskers extend to the minimum and maximum values for each certification body excluding any outliers. The dots represent the outliers present for each certification body (greater than 3/2 time of upper quartile, or less than 3/2 times of lower quartile)

Tables:

Table 1: Excerpt from the Roundtable on Sustainable Palm Oil 2013 International Standard. Principle 5 refers to environmental conservation, and contains 6 criteria including 5.2, which is evidenced by 17 indicators, including 5.2.2 and 5.2.3, which are "major" (must be resolved in 60 days) and "minor" (must be resolved within one year).

Principle 5	Environmental Responsibility and Conservation of Natural Resources and Biodiversity
Criterion 5.2	The status of rare, threatened or endangered species and other High Conservation Value habitats, if any, that exist in the plantation or that could be affected by plantation or mill management, shall be identified and operations managed to best ensure that they are maintained and/or enhanced
Indicator 5.2.2- Major	Where rare, threatened or endangered (RTE) species, or HCVs, are present or are affected by plantation or mill operations, appropriate measures that are expected to maintain and/or enhance them shall be implemented through a management plan. (major)
Indicator 5.2.3	There shall be a programme to regularly educate the workforce about the status of these RTE species, and appropriate disciplinary measures shall be instigated in accordance with company rules and national law if any individual working for the company is found to capture, harm, collect or kill these species.

Table 2: Factors that potentially affect non-compliance number and type, along with their definitions and justifications for inclusion in this study.

Variable	Data Type	Definition	Justification
Audit Category	Categorical	The type of audit conducted, either an initial certification, an annual surveillance, or a re-certification assessment (every 5 years)	The audit category will allow us to see how the type of audit affects non-compliance detection.
RSPO Member	Categorical	The company that owns the mill and supply base.	Variation of non-compliances between members may suggest different costs of certification, and heterogeneous changes needed to achieve certification.
RSPO Standard	Categorical	The principles and criteria against which the supply base was being evaluated, either the 2007 or 2013 International standard.	The standard partly defines stringency within the certification system. Differences in standard content may influence changes required by producers, and auditing against a revised standard may require additional changes from the producer.
Mill Location	Categorical	The Indonesian province where the mill was located.	The geographic location of the mill may have an influence on the type and degree of non-compliances, because different provinces may have different environmental and social obstacles to overcome as well as different local laws.
Effort (days/area)	Continuous	The number of days to complete an audit divided by the total plantation area (ha).	The more time an audit team spends on a plantation, the more likely the team is to detect non-compliances. In addition, effort may serve as proxy for cost of certification.
Supply Chain Model	Categorical	The supply chain model was either identity preserved (IP, identifiable from mill to supply base), mass balance (MB, mixed with conventional palm oil during transport and storage), or segregated (SG, kept apart from conventional palm oil).	The supply chain model may be correlated with the type and number of non-compliances, because it indicates the type of relationship a mill has with its supply base (e.g., mostly owned by plantation versus mostly by another oil palm company).
Year of Certification Update	Continuous	The year the mill received the certificate of conformance associated with the audit report.	Regardless of changes in standards and other confounding factors, auditors may detect more or less problems on certified plantations over time.

Initial Plant	Continuous	The first year that oil palm was planted at the supply base.	Plantations of different ages may require different changes to their practices to achieve compliance with the P&C, because they were developed under variable legal environments and different stages of plantation development may be associated with different types of issues.
Certification Body	Categorical	The certification body is the company in charge of sending licensed RSPO auditors to conducts audits every year.	Characteristics of certification bodies, including goals (e.g., profit, conservation), may affect non-compliances detection.
Lead Auditor	Categorical	The auditor who led the audit team. The RSPO requires that the lead auditor received special certification	Characteristics of individual lead auditors, such as susceptibility to corruption or collusion, may affect non-compliance detection.
Number of Auditors	Continuous	The number of auditors on an assessment team.	The number of auditors may be a proxy for the cost of certification; more auditors may be a signal of the certification body's willingness to pay for the audit. Moreover, the number of auditors may impact the type and number of non-compliances.
Number of Hours to Complete Audit	Continuous	The number of hours required to complete an audit.	The number of hours per audit may be a proxy for the cost of certification. Moreover, the time spent on the audit may affect the quality of the audit, which may impact the total number and type of non-compliances.
Time allotted to comply (days)	Continuous	The days allotted to the company to comply with each non-compliance. This depends largely on the severity of the non-compliance (60 days for major and 365 days for minor non-compliances).	The time allotted to comply will be used in comparison with the time for actual compliance, to understand whether companies are resolving non-compliances in a timely manner.
Time for actual compliance (days)	Continuous	The difference between the date of the audit where a non-compliance was observed, and the date of the written observation that the non-compliance was corrected. Time for actual compliance may be less or more than time allotted to comply.	This will provide information regarding how long it takes to resolve different types of non-compliances, and whether companies are resolving non-compliances in a timely manner.
Open versus closed	Categorical	Whether each recorded non-compliance has been closed	This variable helps us track the status of a non-compliance over time.

Table 3: The frequency of major and minor non-compliances broken down by the thematic areas, grouped by their overarching categories (environmental, social, legal and plantation management)

Category	**Thematic Area**	**Major Non-compliances (#)**	**Minor Non-compliances (#)**
Environmental	Pesticides	35	30
	Environmental Impact Assessment (EIA)	29	21
	Water	28	51
	High Conservation Value Areas (HCV)	22	17
	Pollution	17	30
	Soil	14	31
	Flora & Fauna	6	16
	Fertilizer	4	10
	Fire	3	6
	Energy	0	8
Social	Health & Safety (OHS)	56	112
	Work Contracts	39	47
	Social Impact Assessment (SIA)	37	58
	Training	31	53
	Communities	23	34
	Conflict Resolution	21	12
	Personal Protective Equipment (PPE)	18	17
	Female workers	10	35
	Smallholders	6	6
	Union	6	12
	Housing Facilities	4	30
Legal	Laws & regulations	61	48
	Land use	44	15
	Business Plan	18	4
	Legal boundaries	16	8
	Fresh fruit bunches (FFB) & Price	9	12
Plantation Management	Waste	65	76
	Documents	28	24
	Monitoring & implementation	26	18
	Standard operating procedures (SOP)	24	42
	Equipment	10	24
	High Conservation Value Areas (HCV)	10	16
	Conversion to Oil Palm (OP)	7	8
	Integrated Pest Management (IPM)	5	7
	Emergency & Risk	4	30
	Roads	4	6

*Table 4: Factors affecting non-compliance identification. Summary of mixed effects model results (P<0.001 = ***, P<0.01 = **, P<0.10 = *, for continuous variables + represents a positive relationship, where – represents a negative relationship)*

Fixed effects variables	**Variable Description**	**Total Non-compliances**	**Major non-compliances**	**Minor Non-compliances**
RSPO member	*n* = 29 members	<0.001***	<0.001***	<0.001***
Certification body (CB)	*n* = 8 CBs	0.166	0.613	0.019*
Effort	0.05 ± 0.11 days/ha	0.0919*(+)	0.426 (+)	0.079* (+)
Type of audit	Initial Certification, Surveillance Assessments 1-4, Re-Certification, Surveillance Assessments 11-12	0.0613*	0.020*	0.412
Year of certification update	2008-2015	0.319(-)	0.0297*(+)	<0.001***(-)
Supply chain model	Segregated, Mass Balance, Identity Preserved	0.948	0.654	0.849
Number of auditors	4.22 ± 0.97 auditors/audit	0.229 (+)	0.947 (+)	0.049*(+)

Appendices

Appendix 1: RSPO Principle, Criteria and Indicator Definitions from P&C 2013 Standard

Principle 1	Commitment to Transparency
Criteria 1.1	Growers and millers provide adequate information to relevant stakeholders on environmental, social and legal issues relevant to RSPO Criteria, in appropriate languages and forms to allow for effective participation in decision making.
Indicator 1.1.1	There shall be evidence that growers and millers provide adequate information on (environmental, social and/or legal) issues relevant to RSPO criteria to relevant stakeholders for effective participation in decision making
Indicator 1.1.2-Major	Records for requests for information and responses shall be maintained
Criteria 1.2	Management documents are publicly available, except where this is prevented by commercial confidentiality or where disclosure of information would result in negative environmental or social outcomes
Indicator 1.2.1-Major	Publicly available documents shall include, but not limited to: Criteria 2.2, 4.7, 5.1, 5.2, 5.6, 6.1, 6.3, 6.4, 6.13, 7.1, 7.3, 7.8. 8.1
Criteria 1.3	Growers and millers commit to ethical conduct in all business operations and transactions
Indicator 1.3.1	There shall be a written policy committing to a code of ethical conduct and integrity in all operations and transactions, which shall be documented and communicated to all levels of the workforce and operations
Principle 2	Compliance with Applicable Laws and Regulations
Criteria 2.1	There is compliance with all applicable local, national and ratified international laws and regulations.
Indicator 2.1.1-Major	Evidence of compliance with relevant legal requirements shall be available
Indicator -2.1.2	A documented system, which includes written information on legal requirements, shall be maintained
Indicator -2.1.3	A mechanism for ensuring compliance shall be implemented
Indicator- 2.1.4	A system for tracking any changes in the law shall be implemented
Criteria 2.2	The right to use the land is demonstrated, and is not legitimately contested by local people who can demonstrate that they have legal, customary or user rights
Indicator 2.2.1-Major	Documents showing legal ownership or lease, history of land tenure and the actual legal use of the land shall be available.
Indicator 2.2.2	Legal boundaries shall be clearly demarcated and visibly maintained
Indicator 2.2.3	Where there are or have been disputes, additional proof of legal acquisition of title and evidence that fair compensation has been made to previous owners or occupants shall be available, and that these have been accepted wit free, prior and informal consent (FPIC)
Indicator 2.2.4-Major	There shall be an absence of significant land conflict, unless requirements for acceptable conflict resolution processes are implemented and accepted by the parties involved
Indicator 2.2.5	For any conflict or dispute over the land, the extent of the disputed area shall be mapped out in a participatory way with involvement of affected parties (including neighboring communities where applicable)
Indicator 2.2.6-Major	To avoid escalation of conflict, there shall be no evidence that palm oil operations have instigated violence in maintaining peace and order in their current and planned operations
Criteria 2.3	Use of the land for oil palm does not diminish the legal, customary or user rights of other users without their free, prior and informed consent.
Indicator 2.3.1-Major	Maps of an appropriate scale showing the extent of recognized legal, customary or user rights (2.2, 7.5 and 7.6) shall be developed through participatory mapping involving affected parties
Indicator 2.3.	Copies of negotiated agreements detailing the process of free, prior and informed consent (FPIC) shall be available
Indicator 2.3.3	All relevant information shall be available in appropriate forms and languages, including assessments of impacts, proposed benefit sharing, and legal arrangements

Indicator 2.3.4-Major	Evidence shall be available to show that communities are represented through institutions or representatives of their own choosing, including legal counsel.
Principle 3	Commitment to Long-term Economic and Financial Viability
Criteria 3.1	RSPO Criteria #3.1 There is an implemented management plan that aims to achieve long-term economic and financial viability.
Indicator 3.1.1-Major	Evidence of indicator 3.1.1- A business or management plan (minimum three years) shall be documented that includes where appropriate, a business case for scheme smallholders. (major)
Indicator 3.1.2	Evidence of indicator 3.1.2- An annual replanting programme projected for a minimum of five years (but longer where necessary to reflect the management of fragile soils, see Criterion 4.3), with yearly review, shall be available.
Principle 4	Use of Appropriate Best Practices by Growers and Millers
Criteria 4.1	Operating procedures are appropriately documented, consistently implemented and monitored.
Indicator 4.1.1-Major	Standard Operating Procedures (SOPs) for estates and mills shall be documented.
Indicator 4.1.2	A mechanism to check consistent implementation of procedures shall be in place.
Indicator 4.1.3	Records of monitoring and any actions taken shall be maintained and available, as appropriate.
Indicator 4.1.4-Major	The mill shall record the origins of all third-party sourced Fresh Fruit Bunches (FFB).
Criteria 4.2	Practices maintain soil fertility at, or where possible improve soil fertility to, a level that ensures optimal and sustained yield
Indicator 4.2.1	There shall be evidence that good agriculture practices, as contained in Standard Operating Procedures (SOPs), are followed to manage soil fertility to a level that ensures optimal and sustained yield, where possible.
Indicator 4.2.2	Records of fertilizer inputs shall be maintained.
Indicator 4.2.3	There shall be evidence of periodic tissue and soil sampling to monitor changes in nutrient status.
Indicator 4.2.4	A nutrient recycling strategy shall be in place, and may include use of Empty Fruit Bunches (EFB), Palm Oil Mill Effluent (POME), and palm residues after replanting.
Criteria 4.3	Practices minimize and control erosion and degradation of soils.
Indicator 4.3.1-Major_	Maps of any fragile soils shall be available. (major)
Indicator 4.3.2	A management strategy shall be in place for plantings on slopes above a certain limit (this needs to be soil and climate specific).
Indicator 4.3.3	A road maintenance programme shall be in place.
Indicator 4.3.4-Major	Subsidence of peat soils shall be minimized and monitored. A documented water and ground cover management programme shall be in place.
Indicator 4.3.5	Drainability assessments shall be required prior to replanting on peat to determine the longterm viability of the necessary drainage for oil palm growing.
Indicator 4.3.6	A management strategy shall be in place for other fragile and problem soils (e.g. sandy, low organic matter, acid sulphate soils).
Criteria 4.4	Practices maintain the quality and availability of surface and ground water.
Indicator 4.4.1	An implemented water management plan shall be in place.
Indicator 4.4.2-Major	Protection of water courses and wetlands, including maintaining and restoring appropriate riparian and other buffer zones (refer to national best practice and national guidelines) shall be demonstrated
Indicator 4.4.3	Appropriate treatment of mill effluent to required levels and regular monitoring of discharge quality, especially Biochemical Oxygen Demand (BOD), shall be in compliance with national regulations (Criteria 2.1 and 5.6).
Indicator 4.4.4	Mill water use per tonne of Fresh Fruit Bunches (FFB) (see Criterion 5.6) shall be monitored.
Criteria 4.5	Pests, diseases, weeds and invasive introduced species are effectively managed using appropriate Integrated Pest Management techniques.
Indicator 4.5.1-Major	Implementation of Integrated Pest Management (IPM) plans shall be monitored.

Indicator 4.5.2	Training of those involved in IPM implementation shall be demonstrated.
Criteria 4.6	Pesticides are used in ways that do not endanger health or the environment
Indicator 4.6.1- Major	Justification of all pesticides used shall be demonstrated. The use of selective products that are specific to the target pest, weed or disease and which have minimal effect on non-target species shall be used where available.
Indicator 4.6.2- Major	Records of pesticides use (including active ingredients used and their LD50, area treated, amount of active ingredients applied per ha and number of applications) shall be provided.
Indicator 4.6.3- Major	Any use of pesticides shall be minimized as part of a plan, and in accordance with Integrated Pest Management (IPM) plans. There shall be no prophylactic use of pesticides, except in specific situations identified in national Best Practice guidelines.
Indicator 4.6.4	Pesticides that are categorized as World Health Organization Class 1A or 1B, or that are listed by the Stockholm or Rotterdam Conventions, and paraquat, are not used, except in specific situations identified in national Best Practice guidelines. The use of such pesticides shall be minimized and eliminated as part of a plan, and shall only be used in exceptional circumstances.
Indicator 4.6.5 – Major	Pesticides shall only be handled, used or applied by persons who have completed the necessary training and shall always be applied in accordance with the product label. Appropriate safety and application equipment shall be provided and used. All precautions attached to the products shall be properly observed, applied, and understood by workers (see Criterion 4.7).
Indicator 4.6.6- Major	Storage of all pesticides shall be according to recognized best practices. All pesticide containers shall be properly disposed of and not used for other purposes (see Criterion 5.3).
Indicator 4.6.7	Application of pesticides shall be by proven methods that minimize risk and impacts.
Indicator 4.6.8- Major	Pesticides shall be applied aerially only where there is documented justification. Communities shall be informed of impending aerial pesticide applications with all relevant information within reasonable time prior to application.
Indicator 4.6.9	Maintenance of employee and associated smallholder knowledge and skills on pesticide handling shall be demonstrated, including provision of appropriate information materials (see Criterion 4.8).
Indicator 4.6.10	Proper disposal of waste material, according to procedures that are fully understood by workers and managers shall be demonstrated (see Criterion 5.3).
Indicator 4.6.11- Major	Specific annual medical surveillance for pesticide operators, and documented action to treat related health conditions, shall be demonstrated.
Indicator 4.6.12- Major	No work with pesticides shall be undertaken by pregnant or breast-feeding women.
Criteria 4.7	An occupational health and safety plan is documented, effectively communicated and implemented.
Indicator 4.7.1- Major	A health and safety policy shall be in place. A health and safety plan covering all activities shall be documented and implemented, and its effectiveness monitored
Indicator 4.7.2- Major	All operations where health and safety is an issue shall be risk assessed, and procedures and actions shall be documented and implemented to address the identified issues. All precautions attached to products shall be properly observed and applied to the workers
Indicator 4.7.3- Major	All workers involved in the operation shall be adequately trained in safe working practices (see Criterion 4.8). Adequate and appropriate protective equipment shall be available to all workers at the place of work to cover all potentially hazardous operations, such as pesticide application, machine operations, and land preparation, harvesting and, if it is used, burning.
Indicator 4.7.4- Major	The responsible person/persons shall be identified. There shall be records of regular meetings between the responsible person/s and workers. Concerns of all parties about health, safety and welfare shall be discussed at these meetings, and any issues raised shall be recorded.
Indicator 4.7.5	Accident and emergency procedures shall exist and instructions shall be clearly understood by all workers. Accident procedures shall be available in the appropriate language of the workforce. Assigned operatives trained in First Aid should be present in both field and other operations, and first aid equipment shall be available at worksites. Records of all accidents shall be kept and periodically reviewed.

Indicator 4.7.6	All workers shall be provided with medical care, and covered by accident insurance
Indicator 4.7.7	Occupational injuries shall be recorded using Lost Time Accident (LTA) metrics.
Criteria 4.8	All staff, workers, smallholders and contract workers are appropriately trained.
Indicator 4.8.1-Major	A formal training programme shall be in place that covers all aspects of the RSPO Principles and Criteria, and that includes regular assessments of training needs and documentation of the programme.
Indicator 4.8.2	Records of training for each employee shall be maintained.
Principle 5	Environmental Responsibility and Conservation of Natural Resources and Biodiversity
Criteria 5.1	Aspects of plantation and mill management, including replanting, that have environmental impacts are identified, and plans to mitigate the negative impacts and promote the positive ones are made, implemented and monitored, to demonstrate continual improvement.
Indicator 5.1.1-Major	An environmental impact assessment (EIA) shall be documented
Indicator 5.1.2	Where the identification of impacts requires changes in current practices, in order to mitigate negative effects, a timetable for change shall be developed and implemented within a comprehensive management plan. The management plan shall identify the responsible person/persons.
Indicator 5.1.3	This plan shall incorporate a monitoring protocol, adaptive to operational changes, which shall be implemented to monitor the effectiveness of the mitigation measures. The plan shall be reviewed as a minimum every two years to reflect the results of monitoring and where there are operational changes that may have positive and negative environmental impacts.
Criteria 5.2	The status of rare, threatened or endangered species and other High Conservation Value habitats, if any, that exist in the plantation or that could be affected by plantation or mill management, shall be identified and operations managed to best ensure that they are maintained and/or enhanced.
Indicator 5.2.1-Major	Information shall be collated in a High Conservation Value (HCV) assessment that includes both the planted area itself and relevant wider landscape-level considerations (such as wildlife corridors).
Indicator 5.2.2-Major	Where rare, threatened or endangered (RTE) species, or HCVs, are present or are affected by plantation or mill operations, appropriate measures that are expected to maintain and/or enhance them shall be implemented through a management plan.
Indicator 5.2.3	There shall be a programme to regularly educate the workforce about the status of these RTE species, and appropriate disciplinary measures shall be instigated in accordance with company rules and national law if any individual working for the company is found to capture, harm, collect or kill these species.
Indicator 5.2.4	Where a management plan has been created there shall be ongoing monitoring: • The status of HCV and RTE species that are affected by plantation or mill operations shall be documented and reported; Outcomes of monitoring shall be fed back into the management plan.
Indicator 5.2.5	Where HCV set-asides with existing rights of local communities have been identified, there shall be evidence of a negotiated agreement that optimally safeguards both the HCVs and these rights.
Criteria 5.3	Waste is reduced, recycled, re-used and disposed of in an environmentally and socially responsible manner.
Indicator 5.3.1-Major	All waste products and sources of pollution shall be identified and documented.
Indicator 5.3.2-Major	All chemicals and their containers shall be disposed of responsibly.
Indicator 5.3.3	A waste management and disposal plan to avoid or reduce pollution shall be documented and implemented.
Criteria 5.4	Efficiency of fossil fuel use and the use of renewable energy is optimized.
Indicator 5.4.1	A plan for improving efficiency of the use of fossil fuels and to optimize renewable energy shall be in place and monitored.
Criteria 5.5	Use of fire for preparing land or replanting is avoided, except in specific situations as identified in the ASEAN guidelines or other regional best practice.

Indicator 5.5.1-Major	There shall be no land preparation by burning, other than in specific situations as identified in the 'Guidelines for the Implementation of the ASEAN Policy on Zero Burning' 2003, or comparable guidelines in other regions.
Indicator 5.5.2	Where fire has been used for preparing land for replanting, there shall be evidence of prior approval of the controlled burning as specified in 'Guidelines for the Implementation of the ASEAN Policy on Zero Burning' 2003, or comparable guidelines in other regions.
Criteria 5.6	Plans to reduce pollution and emissions, including greenhouse gases, are developed, implemented and monitored.
Indicator 5.6.1-Major	An assessment of all polluting activities shall be conducted, including gaseous emissions, particulate/soot emissions and effluent (see Criterion 4.4).
Indicator 5.6.2-Major	Significant pollutants and greenhouse gas (GHG)emissions shall be identified, and plans to reduce or minimize them implemented.
Indicator 5.6.3	A monitoring system shall be in place, with regular reporting on progress for these significant pollutants and emissions from estate and mill operations, using appropriate tools.
Principle 6	Responsible Consideration of Employees and of Individuals and Communities Affected by Growers and Millers
Criteria 6.1	Aspects of plantation and mill management that have social impacts, including replanting, are identified in a participatory way, and plans to mitigate the negative impacts and promote the positive ones are made, implemented and monitored, to demonstrate continual improvement.
Indicator 6.1.1-Major	A social impact assessment (SIA) including records of meetings shall be documented.
Indicator 6.1.2-Major	There shall be evidence that the assessment has been done with the participation of affected parties.
Indicator 6.1.3-Major	Plans for avoidance or mitigation of negative impacts and promotion of the positive ones, and monitoring of impacts identified, shall be developed in consultation with the affected parties, documented and timetabled, including responsibilities for implementation.
Indicator 6.1.4	The plans shall be reviewed as a minimum once every two years and updated as necessary, in those cases where the review has concluded that changes should be made to current practices. There shall be evidence that the review includes the participation of affected parties.
Indicator 6.1.5	Particular attention shall be paid to the impacts of smallholder schemes (where the plantation includes such a scheme).
Criteria 6.2	There are open and transparent methods for communication and consultation between growers and/or millers, local communities and other affected or interested parties.
Indicator 6.2.1-Major	Consultation and communication procedures shall be documented.
Indicator 6.2.2	A management official responsible for these issues shall be nominated.
Indicator 6.2.3	A list of stakeholders, records of all communication, including confirmation of receipt and that efforts are made to ensure understanding by affected parties, and records of actions taken in response to input from stakeholders, shall be maintained.
Criteria 6.3	There is a mutually agreed and documented system for dealing with complaints and grievances, which is implemented and accepted by all affected parties.
Indicator 6.3.1-Major	The system, open to all affected parties, shall resolve disputes in an effective, timely and appropriate manner, ensuring anonymity of complainants and whistleblowers, where requested
Indicator 6.3.2-Major	Documentation of both the process by which a dispute was resolved and the outcome shall be available.
Criteria 6.4	Any negotiations concerning compensation for loss of legal, customary or user rights are dealt with through a documented system that enables indigenous peoples, local communities and other stakeholders to express their views through their own representative institutions.
Indicator 6.4.1-Major	A procedure for identifying legal, customary or user rights, and a procedure for identifying people entitled to compensation, shall be in place.
Indicator 6.4.2	A procedure for calculating and distributing fair compensation (monetary or otherwise) shall be established and implemented, monitored and evaluated in a participatory way, and corrective actions taken as a result of this evaluation. This procedure shall take into account: gender differences in the power to claim rights, ownership and access to land; differences of

	transmigrants and long-established communities; and differences in ethnic groups' proof of legal versus communal ownership of land.
Indicator 6.4.3-Major	The process and outcome of any negotiated agreements and compensation claims shall be documented, with evidence of the participation of affected parties, and made publicly available.
Criteria 6.5	Pay and conditions for employees and for contract workers always meet at least legal or industry minimum standards and are sufficient to provide decent living wages.
Indicator 6.5.1-Major	Documentation of pay and conditions shall be available
Indicator 6.5.2-Major	Labour laws, union agreements or direct contracts of employment detailing payments and conditions of employment (e.g. working hours, deductions, overtime, sickness, holiday entitlement, maternity leave, reasons for dismissal, period of notice, etc.) shall be available in the languages understood by the workers or explained carefully to them by a management official.
Indicator 6.5.3	Growers and millers shall provide adequate housing, water supplies, medical, educational and welfare amenities to national standards or above, where no such public facilities are available or accessible.
Indicator 6.5.4	Growers and millers shall make demonstrable efforts to monitor and improve workers' access to adequate, sufficient and affordable food.
Criteria 6.6	The employer respects the rights of all personnel to form and join trade unions of their choice and to bargain collectively. Where the right to freedom of association and collective bargaining are restricted under law, the employer facilitates parallel means of independent and free association and bargaining for all such personnel.
Indicator 6.6.1-Major	A published statement in local languages recognizing freedom of association shall be available.
Indicator 6.6.2	Minutes of meetings with main trade unions or workers' representatives shall be documented.
Criteria 6.7	Children are not employed or exploited
Indicator 6.7.1-Major	There shall be documentary evidence that minimum age requirements are met.
Criteria 6.8	Any form of discrimination based on race, caste, national origin, religion, disability, gender, sexual orientation, union membership, political affiliation, or age, is prohibited
Indicator 6.8.1-Major	A publicly available equal opportunities policy including identification of relevant/affected groups in the local environment shall be documented.
Indicator 6.8.2-Major	Evidence shall be provided that employees and groups including local communities, women, and migrant workers have not been discriminated against.
Indicator 6.8.3	It shall be demonstrated that recruitment selection, hiring and promotion are based on skills, capabilities, qualities, and medical fitness necessary for the jobs available.
Criteria 6.9	There is no harassment or abuse in the work place, and reproductive rights are protected.
Indicator 6.9.1-Major	A policy to prevent sexual and all other forms of harassment and violence shall be implemented and communicated to all levels of the workforce.
Indicator 6.9.2-Major	A policy to protect the reproductive rights of all, especially of women, shall be implemented and communicated to all levels of the workforce
Indicator 6.9.3	A specific grievance mechanism which respects anonymity and protects complainants where requested shall be established, implemented, and communicated to all levels of the workforce.
Criteria 6.10	Growers and millers deal fairly and transparently with smallholders and other local businesses.
Indicator 6.10.1	Current and past prices paid for Fresh Fruit Bunches (FFB) shall be publicly available.
Indicator 6.10.2-Major	Evidence shall be available that growers/millers have explained FFB pricing, and pricing mechanisms for FFB and inputs/services shall be documented (where these are under the control of the mill or plantation).
Indicator 6.10.3	Evidence shall be available that all parties understand the contractual agreements they enter into, and that contracts are fair, legal and transparent.
Indicator 6.10.4	Agreed payments shall be made in a timely manner
Criteria 6.11	Growers and millers contribute to local sustainable development where appropriate.
Indicator 6.11.1	Contributions to local development that are based on the results of consultation with local communities shall be demonstrated.

Indicator 6.11.2	Where there are scheme smallholders, there shall be evidence that efforts and/or resources have been allocated to improve smallholder productivity.
Criteria 6.12	No forms of forced or trafficked labour are used.
Indicator 6.12.1-Major	There shall be evidence that no forms of forced or trafficked labour are used.
Indicator 6.12.2	Where applicable, it shall be demonstrated that no contract substitution has occurred.
Indicator 6.12.3-Major	Where temporary or migrant workers are employed, a special labour policy and procedures shall be established and implemented.
Criteria 6.13	Growers and millers respect human rights.
Indicator 6.13.1-Major	A policy to respect human rights shall be documented and communicated to all levels of the workforce and operations (see Criteria 1.2 and 2.1).
Principle 7	Responsible Development of New Plantings
Criteria 7.1	A comprehensive and participatory independent social and environmental impact assessment is undertaken prior to establishing new plantings or operations, or expanding existing ones, and the results incorporated into planning, management and operations.
Indicator 7.1.1-Major	An independent social and environmental impact assessment (SEIA), undertaken through a participatory methodology including the relevant affected stakeholders, shall be documented.
Indicator 7.1.2	Appropriate management planning and operational procedures shall be developed and implemented to avoid or mitigate identified potential negative impacts.
Indicator 7.1.3	Where the development includes an outgrower scheme, the impacts of the scheme and the implications of the way it is managed shall be given particular attention
Criteria 7.2	Soil surveys and topographic information are used for site planning in the establishment of new plantings, and the results are incorporated into plans and operations
Indicator 7.2.1-Major	Soil suitability maps or soil surveys adequate to establish the long-term suitability of land for oil palm cultivation shall be available and taken into account in plans and operations.
Indicator 7.2.2	Topographic information adequate to guide the planning of drainage and irrigation systems, roads and other infrastructure shall be available and taken into account in plans and operations.
Criteria 7.3	New plantings since November 2005 have not replaced primary forest or any area required to maintain or enhance one or more High Conservation Values (HCVs).
Indicator 7.3.1-Major	There shall be evidence that no new plantings have replaced primary forest, or any area required to maintain or enhance one or more High Conservation Values (HCVs), since November 2005. New plantings shall be planned and managed to best ensure the HCVs identified are maintained and/or enhanced (see Criterion 5.2).
Indicator 7.3.2-Major	A comprehensive HCV assessment, including stakeholder consultation, shall be conducted prior to any conversion or new planting. This shall include a land use change analysis to determine changes to the vegetation since November 2005. This analysis shall be used, with proxies, to indicate changes to HCV status.
Indicator 7.3.3	Dates of land preparation and commencement shall be recorded.
Indicator 7.3.4-Major	An action plan shall be developed that describes operational actions consequent to the findings of the HCV assessment, and that references the grower's relevant operational procedures (see Criterion 5.2).
Indicator 7.3.5	Areas required by affected communities to meet their basic needs, taking into account potential positive and negative changes in livelihood resulting from proposed operations, shall be identified in consultation with the communities and incorporated into HCV assessments and management plans (see Criterion 5.2).
Criteria 7.4	Extensive planting on steep terrain, and/or marginal and fragile soils, including peat, is avoided.
Indicator 7.4.1	Maps identifying marginal and fragile soils, including excessive gradients and peat soils, shall be available and used to identify areas to be avoided
Indicator 7.4.2-Major	Where limited planting on fragile and marginal soils, including peat, is proposed, plans shall be developed and implemented to protect them without incurring adverse impacts.
Criteria 7.5	No new plantings are established on local peoples' land where it can be demonstrated that there are legal, customary or user rights, without their free, prior and informed consent. This is dealt with through a documented system that enables these and other stakeholders to express their views through their own representative institutions.

Indicator 7.5.1-Major	Evidence shall be available that affected local peoples understand they have the right to say 'no' to operations planned on their lands before and during initial discussions, during the stage of information gathering and associated consultations, during negotiations, and up until an agreement with the grower/miller is signed and ratified by these local peoples.
Criteria 7.6	Where it can be demonstrated that local peoples have legal, customary or user rights, they are compensated for any agreed land acquisitions and relinquishment of rights, subject to their free, prior and informed consent and negotiated agreements.
Indicator 7.6.1-Major	Documented identification and assessment of demonstrable legal, customary and user rights shall be available.
Indicator 7.6.2-Major	A system for identifying people entitled to compensation shall be in place
Indicator 7.6.3-Major	A system for calculating and distributing fair compensation (monetary or otherwise) shall be in place.
Indicator 7.6.4	Communities that have lost access and rights to land for plantation expansion shall be given opportunities to benefit from plantation development.
Indicator 7.6.5	The process and outcome of any compensation claims shall be documented and made publicly available.
Indicator 7.6.6	Evidence shall be available that the affected communities and rights holders have access to information and advice, that is independent of the project proponent, concerning the legal, economic, environmental and social implications of the proposed operations on their lands
Criteria 7.7	No use of fire in the preparation of new plantings other than in specific situations, as identified in the ASEAN guidelines or other regional best practice.
Indicator 7.7.1-Major	There shall be no land preparation by burning, other than in specific situations, as identified in the 'Guidelines for the Implementation of the ASEAN Policy on Zero Burning' 2003, or comparable guidelines in other regions.
Indicator 7.7.2	In exceptional cases where fire has to be used for preparing land for planting, there shall be evidence of prior approval of the controlled burning as specified in 'Guidelines for the Implementation of the ASEAN Policy on Zero Burning' 2003, or comparable guidelines in other regions.
Criteria 7.8	New plantation developments are designed to minimize net greenhouse gas emissions.
Indicator 7.8.1-Major	The carbon stock of the proposed development area and major potential sources of emissions that may result directly from the development shall be identified and estimated.
Indicator 7.8.2	Evidence of indicator 7.8.2 There shall be a plan to minimize net GHG emissions which takes into account avoidance of land areas with high carbon stocks and/or sequestration options.
Principle 8	Commitment to Continual Improvement in Key Areas of Activity
Criteria 8.1	Growers and millers regularly monitor and review their activities, and develop and implement action plans that allow demonstrable continual improvement in key operations.
Indicator 8.1.1-Major	The action plan for continual improvement shall be implemented, based on a consideration of the main social and environmental impacts and opportunities of the grower/mill, and shall include a range of Indicators covered by these Principles and Criteria.

Appendix 2: Relevant definitions with regards to the RSPO and the auditing process

	Definition
Annual Surveillance Assessments	Set of activities to monitor the continued fulfillment of requirements for certification
Initial Certification	Process by which a certification body evaluates an operation against the RSPO Standard
Re-certification	Certification body re-evaluates an operation against the RSPO standard
High Conservation Value Areas	The areas necessary to maintain or enhance one or more high conservation values (HCVs) - HCV 1- Species diversity: concentrations of biological diversity including endemic species, and rare, threatened or endangered species, that are significant at global, regional or national levels - HCV 2- Landscape level ecosystems and mosaics: large landscape-level ecosystems and ecosystem mosaics that are significant at global, regional or national levels, and that contain viable populations of the great majority of the naturally occurring species in natural patterns of distribution and abundance - HCV 3- Ecosystems and habitats: rare, threatened, or endangered ecosystems, habitats or refugia - HCV 4- Critical ecosystem services: basic ecosystem services in critical situations, including protection of water catchments and control of erosion and vulnerable soils and slopes - HCV 5- Community needs: sites and resources fundamental for satisfying the basic necessities of local communities or indigenous peoples (for livelihoods, health, nutrition, water, etc.) identified through engagement with these communities or indigenous people - HCV 6- Cultural values: sites, resources, habitats and landscapes of global or national cultural archaeological or historical significance, and/or of critical cultural, ecological, economic or religious/sacred importance for the traditional cultures of local communities
Major non-compliance	When a supply base is failing to meet a relevant compulsory indicator, which impacts the achievement of the objectives of the standard
Minor non-compliance	When a supply base is failing to meet other indicators, which have only temporary non-systematic impacts
Observations	A documented statement, which may identify areas for improvement, but shall not make specific recommendations

Appendix 3: Breakdown of the most and least frequently violated Principle & Criteria with their Criteria descriptions, number of non-compliances in our sample of 116 mills and 254 audits in Indonesia from 2008-2015, and number of thematic area as defined by textual descriptions from the audit reports

Principle & Criteria	Description	No. of Non-Compliances	No. of Thematic Areas
4.7	Occupational health and safety plan	243	16
4.6	Pesticides are used in ways that do not endanger health or the environment	147	13
2.1	Compliance with all local, national and international laws	146	23
6.1	Aspects of plantation and mill management that have social impacts are identified in a participatory way and plans to mitigate negative impacts and promote positive ones are made, implemented and monitored.	102	15
5.3	Waste is reduced, recycled, reused and disposed of in an environmentally and socially responsible manner	99	13
5.2	The status of rare, threatened or endangered species and other High Conservation Value habitats, if any, shall be identified and managed to ensure they are maintained or enhanced.	98	13
2.2	The right to use the land is demonstrated and not legitimately contested	89	15
6.5	Pay and conditions for employees and for contract workers always meet at least legal or industry minimum standards and are sufficient to provide decent living wages	82	11
4.4	Practices maintain the quality and availability of surface and ground water	75	11
5.1	Aspects of plantation and mill management including replanting, that have environmental impacts are identified with plans to mitigate potential negative impacts and promote positive ones	64	11
4.1	Operating procedures are appropriately documented, implemented and monitored	58	13
5.6	Plans to reduce pollution and emissions, including GHG are developed, implemented and monitored	57	9
4.8	All staff, workers, smallholders and contract workers are appropriately trained	36	6
6.9	There is no harassment or abuse in the work place and reproductive rights are protected	33	4

4.5	Pests, diseases, weeds and invasive introduced species are effectively managed using IPM techniques	32	9
4.2	Practices maintain or improve soil fertility, to ensure optimal and sustained yield.	29	9
4.3	Practices minimize and control erosion and degradation of soils.	29	7
6.3	There is a mutually agreed and documented system for dealing with complaints and grievances	28	6
1.1	Mills provide adequate information to relevant stakeholders on all aspects of RSPO criteria, in appropriate languages for effective participation in decision making	26	10
3.1	Implemented management plan to achieve long-term economic viability	23	5
8.1	Growers and millers regularly monitor and review their activities, develop and implement action plans that demonstrate continual improvement	23	7
6.10	Growers and millers deal fairly and transparently with smallholders and other local businesses	22	6
6.2	There are open and transparent methods for communication and consultation between stakeholders and communities	19	6
5.5	Use of fire for preparing land or replanting is avoided, except in specific situations according to ASEAN guidelines	19	6
5.4	Efficiency of fossil fuel use and the use of renewable energy is optimized	18	4
6.6	The employer respects the rights of all personnel to form and join trade unions of their choice and to bargain collectively	16	4
7.3	New plantings since Nov 2005 have not replaced primary forest or any area required to enhance one or more HCVs	16	4
1.2	Management documents are publicly available, except where this is prevented by commercial confidentiality or disclosure of information would result in negative environmental or social outcomes	14	5
1.3	Mills commit to ethical conduct in all business operations	13	3
2.3	Use of the land for oil palm does not diminish the legal, customary or user righters without free, prior and informed consent	13	2
6.11	Growers and millers contribute to local sustainable development where applicable	11	3

6.4	Any negotiations concerning compensation for loss of legal, customary or user rights are dealt with through a documented system that enables indigenous peoples, and local stakeholders	9	5
6.7	Children are not employed or exploited	8	2
6.8	Any form of discrimination based on race, caste, national origin, religion, disability, gender, sexual orientation, union membership, age, political affiliation is prohibited.	8	4
6.13	Growers and millers respect human rights	4	2
7.1	A comprehensive and participatory independent social and environmental impact assessment is undertaken prior to establishing new plantings or expanding existing ones	3	2
7.8	New plantation developments are designed to minimize net GHG	3	2
7.5	No new plantings are established on local peoples' land where it can be demonstrated that there are legal, customary or user rights, without their free, prior and informed consent.	3	3
7.4	Extensive planting on steep terrain and/or marginal and fragile soil, including peat is avoided	2	2
6.12	No forms of forced or trafficked labor are used	1	1
7.6	Where it can be demonstrated that local peoples have legal rights, they are compensated for any agreed land acquisitions and relinquishment of rights, subject to FPIC	1	1
7.7	No use of fire in the preparation of new plantings other than in specific situations identified in ASEAN guidelines	1	1

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